# Marine Engineering
## And Shipping Age

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# Marine Engineering
## and Shipping Age

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## Naval Reduction

AT this writing it is impossible to predict, with any degree of certainty, the final outcome of the Geneva Conference. Thus far it has rather clearly demonstrated the vast difference between giving and taking, be the contracting parties nations or individuals, but no very material progress toward the end in view appears to have been made.

At the time of the Washington Conference this country had in process of construction what undoubtedly would have been, had it been completed, the most powerful fighting fleet in the world. Moreover it was, at the time, the only nation financially able to undertake such a large program without imposing upon its people ruinous taxation. As a result of this conference the United States scrapped the larger part of the new vessels which it had in course of construction and also all of its older battleships. England disposed of some of its later battleships but received permission to build new ones which now are completed and, presumably, are the most powerful and efficient fighting machines in the world. On paper the fighting fleets of the two nations are now equal while that of Japan is smaller, in the ratio of 3 to 5.

The Washington Conference did not limit the number of cruisers that might be built but did fix the maximum size at 10,000 tons. Ships of this tonnage were shortly laid down by the three principal naval powers and it became evident that competition in armaments, denied for the time to the battle fleets, might merely transfer itself to the smaller but nevertheless very expensive fast cruiser, a type of ship which, with battleships out of the picture, becomes, in every sense, a fighting unit. It was with this condition in mind that Mr. Coolidge called together the present conference.

It has been evident from the start that the shoe is now on the other foot. England, which could look on with complacency while we proceeded to give up the prospect of a battle fleet larger than her own, finds the situation quite different when it is suggested that she reduce the number of her cruisers—if the British papers are to be believed, she will never really seriously consider such a reduction. The British now propose that the size and armament of cruisers should be restricted to 6,000 tons and 6-inch guns respectively, but with the number of vessels unlimited and suggests that the building of 10,000-ton ships with 8-inch guns has been forced upon her. In other words, she proposes to have as many large cruisers as anyone else, although she believes their construction inadvisable and as many small cruisers as she thinks she may need without limit by any international agreement. The United States proposes parity with Great Britain in cruiser tonnage, thus, it is claimed by the other parties to the conference, practically insuring the construction of ships of maximum size.

It is a difficult matter to judge any controversy from the "other fellow's" point of view. We, on this side of the Atlantic, will do well to remember that the very life of Great Britain is dependent upon her merchant ships and their ability to keep the sea in face of every obstacle. If any proof of this fact was needed, it was abundantly furnished during the late war, furnished in a manner that no living Britain is likely to forget. At whatever cost her merchant ships must be protected and this she apparently feels can best be accomplished by a large tonnage of relatively small vessels. She cannot see that our present or prospective merchant fleets can ever demand the naval protection which she considers necessary for her own. Looked at from the British point of view her contention is reasonable; she cannot afford to take chances where her national existence is concerned.

On the other hand this country, as a world power, has in recent years acquired an entirely new position. We have a considerable overseas merchant fleet and trade which in the next decade is likely to increase in size and volume. We have distant overseas possessions, few and widely spread naval bases. Great Britain has naval bases in every quarter of the globe. If longer distances have to be covered, larger ships are needed and so our navy is



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building 10,000-ton ships, which the British, from their point of view, consider unnecessary. Incidentally, they have some 20 fast convertible liners which may in some measure account for this feeling but this has so far been kept well in the background. It seems to us that neither point of view is entirely reasonable. We need some of the larger type of cruisers, more, perhaps, than Great Britain. We need some smaller ships but surely not so many as Great Britain. If the nations are sincere in their desire to reduce naval armaments, and we believe the people of all the three nations concerned in the present conference are sincere in such desire, it should not be impossible to arrive at some agreement. As, between the two larger powers, war is inconceivable, then why assume the necessity of building ship for ship, be the latter large or small. It seems to us that the possibility of a satisfactory adjustment is so great that in the final analysis of the cruiser situation it cannot well be avoided by the conferees. Some new ships may well be built by all three participants; that an unlimited number of *any* class should be allowed either would seem to defeat the ends which all profess to seek—the reduction of naval forces.

So far as smaller vessels, destroyers and submarines, are concerned, it has been reported that the conference is in a fair way of reaching an agreement. Japan, remembering the Russian war, desires unlimited small submarines, a request which in view of its far reaching possibilities as affecting the claims of the nations of continental Europe is not likely to be granted, but Japan's safety can be well guaranteed in other ways.

After all it is largely with paper fleets that the conference is dealing. Given navies equal, ship for ship, the control of the seas will rest with the nation having otherwise the greatest potential sea power. This nation is Great Britain. It has a navy nominally the equal of any other, actually, because of its enormous shipping and shipbuilding resources, the most powerful in the world. It has more fast liners capable of conversion to cruisers than all other nations combined and by far the largest fleet of commercial vessels and body of skilled seamen and engineers at present afloat on the seven seas. With the former threat of the aspiring Kaiser's navy removed her safety stands assured today. It is difficult to see just why she should need the 600,000 tons of cruisers which Mr. Bridgeman has demanded and we find it hard to believe that this demand or our own insistence on fleet parity, with which we entered it, will be allowed to break up the conference.

## The Latest Achievement in Marine Engineering

WHILE it may be some little time before a steam pressure equaling that used on the *King George V* is found in a marine steam installation of great power there is a very obvious trend toward what might be termed "powerhouse practice" in the machinery recently built or now under construction for installation in large, high class commercial vessels. In this country, the *Dixie*, now being built for the Southern Pacific Line by the Federal Shipbuilding and Dry Dock Company, will use steam at 350 pounds pressure and 200 degrees superheat, while in Great Britain a number of large vessels are in course of construction which will use steam at approximately the same high pressure and heat.

Of these latest large plants the first to have its steam trials and to get into actual service is that installed in the Canadian Pacific Liner *Empress of Australia,* which is described elsewhere in this issue. The interesting fact in regard to this machinery is that it has produced phenomenal results without resort to any very startling departures from recent good marine practice in machinery design. Indeed, the present machinery installation of the *Empress of Australia,* as compared with that originally fitted on the ship might be considered, by the more radically inclined among our engineering friends, as in some ways a step to the rear. As is well known, the building of this ship was commenced in Germany shortly before the war. After the armistice the vessel was completed and turned over to the British as part of the reparations award, eventually coming into the possession of the Canadian Pacific Company. The original propelling machinery consisted of Parsons triple expansion turbines of the nonreversing type, fitted with impulse wheels at the high pressure end. These turbines ran at 800 revolutions per minute and operated the propellers at a rate of 160 revolutions per minute through Föttinger hydraulic, reversing transformers. Steam was supplied by watertube, oil burning boilers at a pressure of 250 pounds per square inch.

This machinery has now been replaced by Parsons reaction turbines with end tightened blading in the high pressure units, which drive the propellers at 125 revolutions per minute through single reduction mechanical gearing. Steam is supplied by oil burning Scotch boilers at a pressure of 220 pounds per square inch and 240 degrees superheat. The old turbine driven generating sets have been retained as "standbys," but two new Diesel driven generators, capable of carrying the full lighting and power load, have been added. The main engine room auxiliaries are, however, operated by steam. Finally, unusually large air heaters were fitted in the uptakes.

It will be noted that, as compared with the original machinery, the steam pressure has been reduced 30 pounds per square inch, watertube boilers have given place to Scotch, impulse wheels have been omitted from the go-ahead turbines and steam has been retained to drive the circulating pumps and feed pumps. Thus, on the surface, the plant is a conservative one, particularly as regards steam pressure. Nevertheless, its performance is remarkable. With the original machinery the best sea speed attained was 16½ knots with a gross fuel consumption of 205 tons a day. Now the ship will steam approximately 19 knots with a fuel consumption of 150 tons of fuel oil per day, for all purposes. Running at 16½ knots, a voyage may now be completed in the same time as with the old machinery with an expenditure of 100 tons of oil per day—less than half the amount originally needed.

Superheat, preheated draft and the Diesel auxiliaries of

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course contributed largely to the attaining of these remarkable figures, but taking the plant and its performance as a whole, one is mainly impressed by it as an example of conservative, but constructive and advanced engineering of the very highest type. The changes in the machinery itself were by no means the only ones made. The early performances of the ship had indicated that the propulsive coefficient, as well as the fuel performance, was unsatisfactory and in consequence exhaustive model tank experiments were carried out to determine the possibility of improving propeller performance. These resulted in a reduction of propeller revolutions, as already mentioned, and also in the decision to change the direction of rotation from outboard to inboard turning. The results obtained with actual vessels, in the past, have, so far as the writer knows, nearly always indicated that outboard turning propellers were more efficient than inboard turning; in certain cases, when the latter were employed, the maneuvering qualities of the vessel were certainly below par. Model tank experiments indicate that the relative efficiency of the two methods is determined by the location of the propellers and by details of hull form, such as shape and slope of shaft bossing. In the case of the *Empress of Australia* the propulsive coefficient was materially improved by turning the propellers inboard.

While it is true that the *Empress of Australia*, as originally engined, was a poor performer and that the room for improvement was obviously great, one can feel only admiration for the superlative engineering skill which made possible an improvement of over 100 percent. It not only represents the practical application of a vast fund of past engineering experience, but the most painstaking study and experimentation as applied to the peculiar conditions of a particular ship. Mr. Johnson, the superintending engineer of the Canadian Pacific Company, who was mainly responsible for the arrangement and characteristics of the new machinery, and the Fairfield Company, of Glasgow, which carried out the work, have behind them a piece of engineering of which they may well be proud.

In recent years so many changes and novelties have come into use aboard ship that one is apt to forget, in considering the claims made for any one of them, the absolute necessity of its appropriate and skilful use, if success is to be attained. Nothing is more certain than that the finest machine or piece of apparatus may prove a failure when operated by unskilled hands or when applied to work for which it is not fitted; in other words, the skilled engineer must always be superior to the machines or devices which he makes use of. Installations like that on the *Empress of Australia* and such as designated by Mr. Metten of Cramp's for the cruisers now building for our navy are outstanding examples of what may be accomplished by courage and enterprise when tempered and steadied by the experience and judgment of the really skilled engineer.

Incidentally it should be noted that in addition to the fitting of the new machinery, the passenger accommodations of the ship have been extensively overhauled and refitted, so that today the *Empress of Australia* is, in every department, one of the finest and most modern liners afloat.

## A Doubtful Policy

THE announcement that the Shipping Board is seriously contemplating the alteration of the hull forms of certain of its large cargo vessels in order to increase their speed must come as a surprise, even a shock, to every commercial naval architect and shipbuilder. Last fall, when it was first hinted that such a scheme had been proposed, the comment was made in these columns that practical men could hardly take the project seriously were it not for the names of the eminent naval architects that were coupled with it. Now, however, it appears that an investigation has been made and the board advised to proceed with the work; moreover the fitting of Diesel-electric drive is recommended.

That ten-year old, emergency built cargo vessels are to have their ends cut off and replaced—the most expensive portions of a vessel's structure—and in addition to this are to be provided with what is very generally supposed to be an expensive form of propelling machinery seems, on the surface at least, scarcely conceivable. It may be at once admitted that without the substance of the advisory report in front of one it is impossible to make detail criticism, but it would seem that the general nature of the proposed alterations is such that there are certain fundamental facts which must apply, whatever form the final details may assume.

Considering first hull changes looking to increased speed, three things may be done. First, the draft may be decreased. This reduces deadweight and from the apparent point of view of the Shipping Board would be ridiculous as the value of the ship based on deadweight capacity would be correspondingly reduced. As a matter of fact, it is just what has been done, and with entirely satisfactory results, in other government shelter deck vessels when they came into the possession of private owners. Cargoes, to the Far East, are largely measurement, not deadweight. The ships which it is now proposed to alter have a rather low cubic capacity as compared with their deadweight, moreover they have no tonnage openings. These would certainly be cut if the vessels are to operate through the Panama Canal and a very material reduction in draft and deadweight would automatically follow. As to just what this draft reduction would be it is, of course, impossible to say without making a freeboard calculation from the ship's plans, but from comparison with other shelter deck ships of the same length and depth it seems probable that the reduction would be in the neighborhood of 2 feet and this should result in an appreciable increase in speed, from one-quarter to one-half knot, for equal power; an increase, by the way, which would be obtained without a cent of direct expenditure as the tonnage openings in any event would have to be put in to save canal dues. Secondly, without interfering with the lines and at a minor expense as compared with the cost of structural changes, improvement in speed might be effected by the fitting of a contrapropeller, Oertz rudder or other wake guiding device. Here again the absence of definite figures makes any predictions very uncertain but so far as one can judge from the power gains made by contrapropellers in single screw ships of full form, as applied

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to the model tank curves of the ships under consideration, a gain in speed of from one-half to three-quarters of a knot might reasonably be expected as the result of fitting wake guiding devices. Thus it appears at least possible to realize a gain in speed of approximately one knot without resorting to any structural changes whatever.

Turning now to the third method by which increased speed may be obtained from hull changes—line alteration—in other words changing entrance and run so as to decrease residual resistance and increase propeller efficiency, the problem becomes quite different and much more serious. It is hardly conceivable that extensive structural changes should be undertaken unless a material speed gain is to result, certainly more than the one knot indicated above. Some gain might be derived from a fining of the forward lines, the result of building a new and longer bow, but the run is where the most gain must be looked for and the cost of building an entire new stern would appear prohibitive. In view of the fact that electric drive is to be adopted it is fair to assume that a large diameter, slow turning wheel is contemplated. This in itself will mean a new stern frame and an entire re-location of shafting and stern tube, a very expensive undertaking. If a new bow is built and the stern frame and shafting changed to accommodate a large propeller, the cost of the alterations might well run to $250,000 per ship and it does not seem probable that the resulting gain in speed could be commensurate with any such expenditure. If the draft must in any case be decreased, and this seems certain, and if the contrapropeller can help these vessels to the extent it is known to have helped others, there appears to be small excuse for spending money on hull structure.

Turning now to the question of propelling machinery, while it is very generally admitted that Diesel electric drive is admirably adapted to meet certain special conditions of ship operation, the arguments for fitting it in straight cargo vessels are much less convincing. It is true that a slow speed propeller is desirable in this class of ship, but it is equally true that the electric drive involves a transmission loss not present in direct connected machinery. With the ships under consideration it appears doubtful that a gain sufficient to overcome the electrical losses can be realized by the use of a large propeller. Furthermore the reduction in cost of the non reversible Diesels will have to be sufficient to offset the cost of the electrical equipment, which with the heavy, slow speed motor required will be considerable, if the expense of conversion is to be kept down to that of a direct drive.

In this connection it is only fair to draw attention to the fact that the installation of an electric drive in an old vessel, so far as structural changes are concerned, would appear to be a somewhat less serious matter than the preparatory and foundation work incident to the installation of a heavy direct drive engine. Furthermore the fitting of electric drive would presumably do away with an auxiliary engine and generator equipment. Taken together these two circumstances should materially help to equalize the overall cost of installation of the two systems of propulsion.

There is quite another side to this matter, an ethical one, to which the Shipping Board may well give consideration. When the Diesel conversion program was laid down it was generally understood that one of the main reasons for its inception was to help the shipyards. As is well known, not one of the new engines has been built in a shipyard machine shop; all that the shipyards got out of it was the installation, a very doubtful benefit. In their turn, the Diesel engine builders were persuaded or cajoled into furnishing machinery at prices which have involved every one of them in serious financial loss. Now it is rumored that certain members of the board are ready to turn to new fields, leaving "out in the cold" those who by going down deep into their own pockets have made the present conversion program a success. This should not be. It is the kind of proceeding which is largely responsible for drawing down upon the Shipping Board the criticism to which it is constantly subjected.

## The Measurement of Propeller Thrust

IN the description of the new propelling machinery of the steamship *Empress of Australia,* which appears elsewhere in this issue, mention is made of a device whereby the thrust delivered by the propeller may be measured at the thrust block. While this method of determining propeller efficiency is not new, the fitting of such measuring apparatus as part of the regular equipment of a commercial vessel is a very recent development and so far has been applied to comparatively few vessels.

The field opened up is a most interesting and important one. Neither indicated nor shaft horsepower takes any account of propeller efficiency yet they have been, until the present, the only means whereby the ship operator could obtain, in terms of power, some idea of what return he was getting on his investment in fuel. Notwithstanding the vast amount of thought and experiment which has been devoted to it, the propeller problem is by no means entirely and satisfactorily solved. This fact becomes at once evident when even a slight departure is made from past practice. The increase in propeller speed accompanying the adoption of direct drive Diesel engines is a case in point.

What the operator actually pays for is thrust horsepower and evidently this can be accurately determined only by direct measurement—the relations between the tow rope resistance of the model and the thrust needed to propel the actual vessel are too complex to admit of positive mathematical determination.

While the results of trials in which thrust has been measured have been found in many cases to be unsatisfactory, there seems every reason to believe that it may be measured with fully as great, if not greater, accuracy than is possible with indicated or shaft horsepower. Its accurate determination certainly appears of more direct and vital importance to practical ship operation than either of the others and it will be somewhat surprising if the thrust indicator does not come into general use on high class vessels in the near future.

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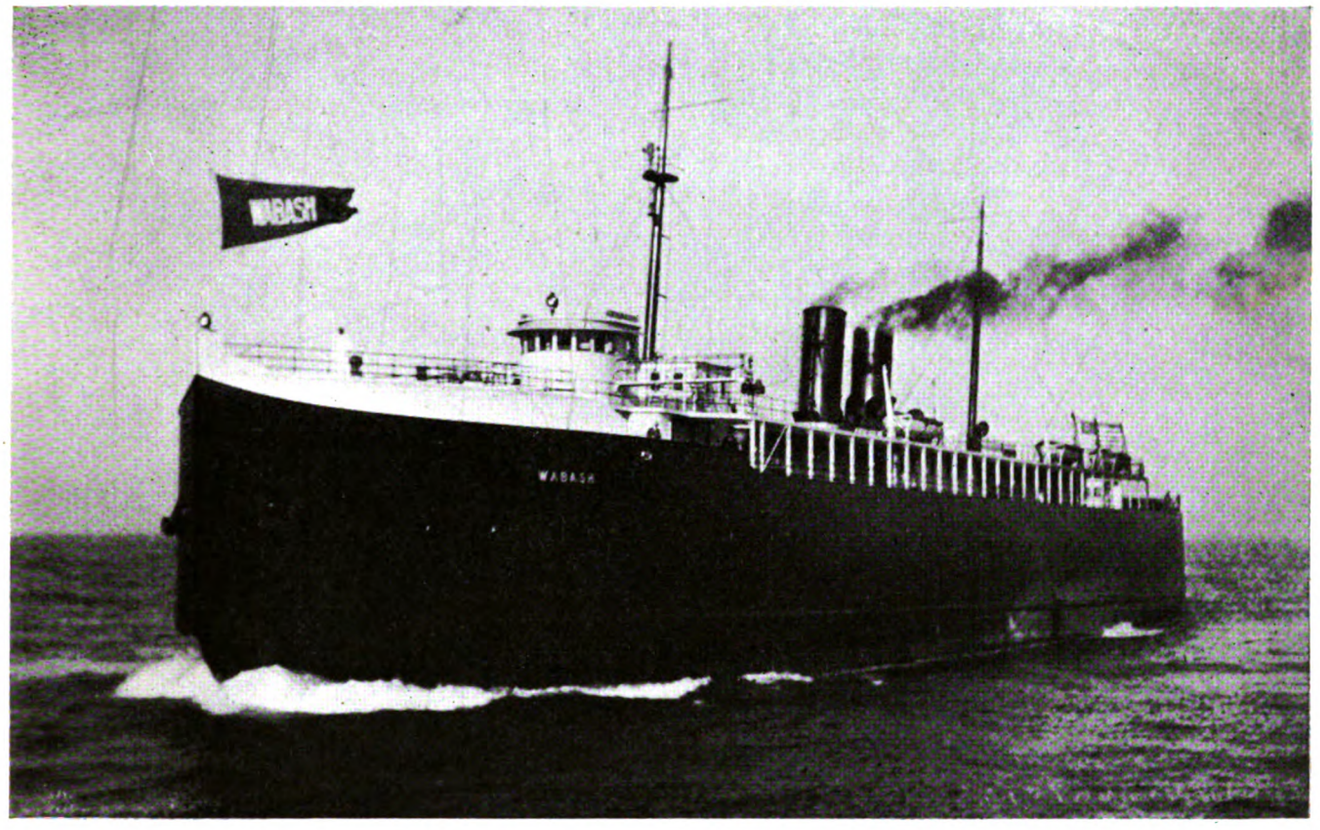


**Railway car and passenger ferry boat Wabash**

# Twin Screw Steel Car Ferry Wabash

## Built by the Toledo Shipbuilding Company for the Ann Arbor Railroad Company for service on Lake Michigan

AS a part of its rail system the Ann Arbor Railroad Company operates a fleet of steel passenger and car ferry boats on Lake Michigan from Frankfort, Mich., to Manistique, Mich., Menominee, Mich., Manitowoc, Wis., and Kewaunee, Wis. These vessels are operated the year round and while they are designed primarily to transport railroad cars they are also equipped with comfortable modern passenger accommodations. Until this year this fleet included 5 vessels of the following dimensions:

| | Length, feet | Beam, feet | Gross tonnage | Horsepower | Speed, miles per hour |
|---|---|---|---|---|---|
| *Ann Arbor No.* 3..... | 307 | 52 | 2,047 | 1,400 | 13.0 |
| *Ann Arbor No.* 4..... | 259 | 52 | 1,778 | 1,200 | 12.5 |
| *Ann Arbor No.* 5..... | 360 | 56 | 2,884 | 3,000 | 13.0 |
| *Ann Arbor No.* 6..... | 338 | 56 | 2,716 | 3,000 | 13.0 |
| *Ann Arbor No.* 7..... | 348 | 56 | 2,934 | 3,000 | 14.6 |

This year, however, the fleet has been increased by the completion of a new vessel, named the *Wabash*, which is larger than her predecessors. The *Wabash* was built at the yards of the Toledo Shipbuilding Company, Inc., Toledo, O., and has the following dimensions:

| | |
|---|---|
| Length overall | 380 feet |
| Length between perpendiculars | 368 feet |
| Beam, molded | 57 feet 6 inches |
| Depth to main deck | 21 feet 6 inches |
| Depth at center, main to shade deck | 17 feet 7 inches |
| Depth at side, main to shade deck | 17 feet 4 inches |
| Maximum mean draft | 16 feet |
| Camber of main deck beams | 9 inches |
| Camber of shade deck beams | 12 inches |
| Rise of floor | 2 feet |
| Speed, miles per hour | 13½ |

The *Wabash* is a twin screw vessel with two complete decks. On the main deck are 4 tracks for carrying railway cars of sufficient length to take thirty 42-foot cars. On the shade deck is a steel deck house containing 18 staterooms, a ladies' parlor, lounge, smoking room, dining room and galley and accommodations for part of the crew. The hull is cut away at the bow to aid in crushing ice during the winter season. It is transversely framed with a single bottom and 7 watertight transverse bulkheads extending through the lower hold space and dividing the hull into 8 watertight compartments. The propelling machinery is located amidships.

The general arrangement of the vessel is shown in the plans and the scantlings of the hull in the midship section. Five rows of stanchions are fitted in the hold extending from the forward to the after collision bulkhead. The coal bunkers are arranged alongside the boilers and extend from the after end of No. 2 hold to the forward end of the engine room, each side being divided by a 4-foot recess for an ash gun. At the after end of No. 2 hold are fitted two wing tanks, each having a capacity of 60 tons of water. These tanks are arranged for trimming the ship athwartship after loading cars and are connected to the ballast pumps in the engine room. Four longitudinal plate girders are fitted under the main deck aft arranged to carry the



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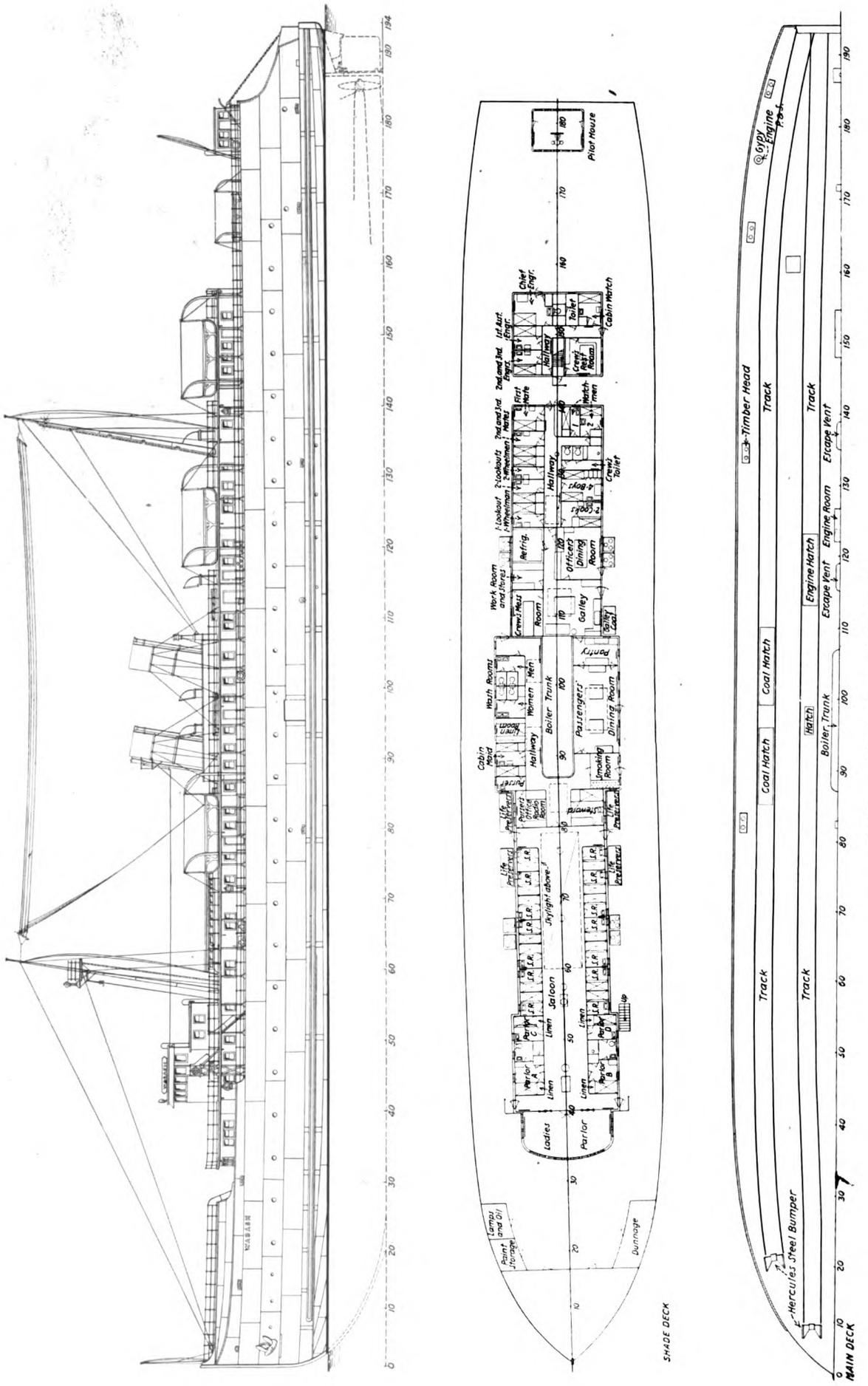


**Profile and deck plans of the Wabash**

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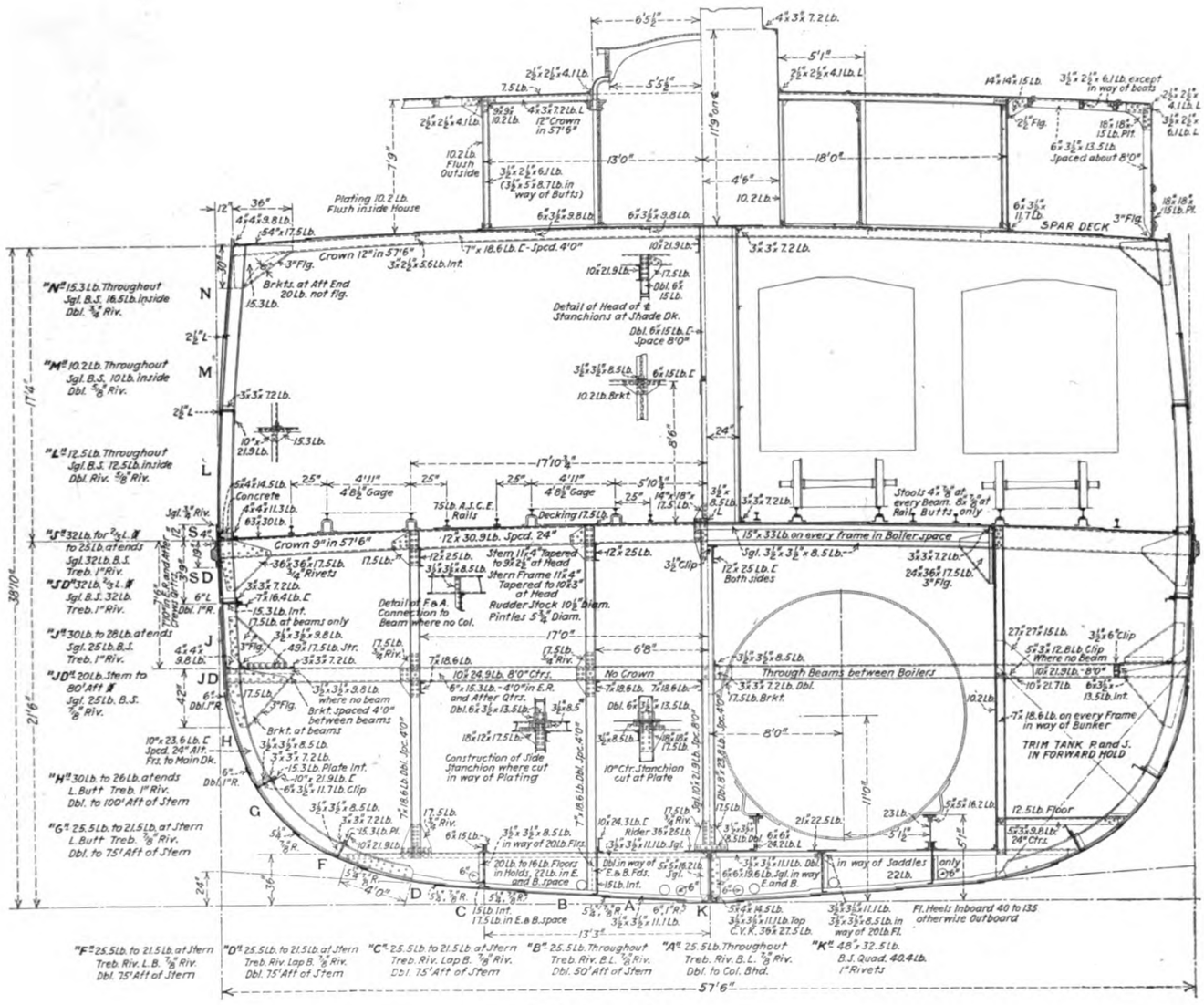

SPAR DECK
Crown 12" in 57'6"
Crown 9" in 57'6"
Detail of Head of Stanchions at Shade Dk.
Detail at F.&A. Connection to Beam where no Col.
Construction of Side Stanchion where cut in way of Plating
Through Beams between Boilers
TRIM TANK P and S. IN FORWARD HOLD
Stools 4" x 3/8" at every Beam 6" x 3/8" at Rail Butts only
Decking 17.5 Lb.
Stem 11"x4" Tapered to 9"x2½" at Head
Stern Frame 11"x4" Tapered to 10"x3" at Head
Rudder Stock 10½" Diam.
Pintles 5¾" Diam.
Plating 10.2 Lb. Flush inside House
Flush Outside
Fl. Heels Inboard 40 to 135 otherwise Outboard
"N" 15.3 Lb. Throughout Sgl. B.S. 16.5 Lb. Inside Dbl. ⅝" Riv.
"M" 10.2 Lb. Throughout Sgl. B.S. 10 Lb. Inside Dbl. ⅝" Riv.
"L" 12.5 Lb. Throughout Sgl. B.S. 12.5 Lb. Inside Dbl. Riv. ⅝" Riv.
"S" 32 Lb. for ⅔ L. to 25 Lb. at ends Sgl. 32 Lb. B.S. Treb. 1" Riv.
"SD" 32 Lb. ⅔ L. Sgl. B.S. 32 Lb. Treb. 1" Riv.
"J" 30 Lb. to 28 Lb. at ends Sgl. 25 Lb. B.S. Treb. 1" Riv.
"JD" 20 Lb. Stem to 80' Aft Sgl. 25 Lb. B.S. ⅞" Riv.
"H" 30 Lb. to 26 Lb. at ends L. Butt Treb. 1" Riv. Dbl. to 100' Aft of Stem
"G" 25.5 Lb. to 21.5 Lb. at Stern L. Butt Treb. ⅞" Riv. Dbl. to 75' Aft of Stem
"F" 25.5 Lb. to 21.5 Lb. at Stern Treb. Riv. L. B. ⅞" Riv. Dbl. 75' Aft of Stern
"D" 25.5 Lb. to 21.5 Lb. at Stern Treb. Riv. Lap B. ⅞" Riv. Dbl. 75' Aft of Stern
"C" 25.5 Lb. to 21.5 Lb. at Stern Treb. Riv. Lap B. ⅞" Riv. Dbl. 75' Aft of Stern
"B" 25.5 Lb. Throughout Treb. Riv. B.L. ⅞" Riv. Dbl. 50' Aft of Stern
"A" 25.5 Lb. Throughout Treb. Riv. B.L. ⅞" Riv. Dbl. to Col. Bhd.
"K" 48" x 32.5 Lb. B.S. Quad. 40.4 Lb. 1" Rivets
57'6"

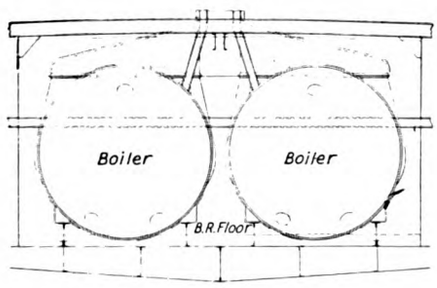
**Midship section**

overhang of the stern. These extend forward to the after peak bulkhead. Two side ports, one on each side, are installed abreast the boiler casing. These are 6 feet high by 6 feet wide and are arranged to swing inboard. A sea gate, 60 inches high, is fitted at the after end of the hull and is so arranged that it can be lifted by a gate winch 6 inches by 6 inches by 8 inches to a sufficient height to clear the railway cars. In lower No. 2 hold two fresh water tanks of 3,000 gallons capacity each are installed and a sewage tank of about 2,000 gallons capacity is installed in No. 3 hold to take the discharge of all plumbing fixtures below the water line.

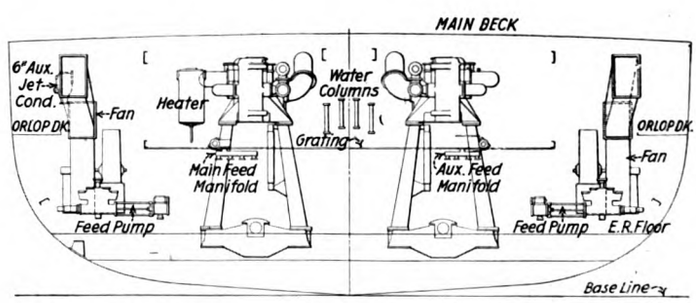
The life saving equipment includes 6 metallic lifeboats, each with a capacity of 25 persons, and a wood work boat 14 feet by 5 feet. The boats are installed under round bar davits equipped with Jacques patented hoists.

On the spar deck aft a 5-ton steel derrick is installed so that automobiles can be lifted in a special sling to the spar deck.

The deck machinery includes an electrically driven Hyde windlass and a Benson Electric Company electric mooring winch located on the spar deck forward; 4 steam gypsies on the main deck, two of them 8-inch by 8-inch and two of them 6-inch by 8-inch, and a Manitowoc steam steering engine on the orlop deck aft. The vessel is heated with steam and lighted with electricity, and is the first car




**Section through boiler room**




**Section through engine room, looking aft**

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ferry on the Lakes having any of the deck machinery driven by electricity. The electrical plant consists of one 50-kilowatt and two 25-kilowatt Engberg generator sets. A 1-ton ice machine is installed in the engine room.

The propelling machinery consists of two vertical triple expansion jet condensing engines connected to outboard turning propellers. The cylinders of the engines are 20½, 34 and 56 inches diameter by 36-inch stroke. Each engine is fitted with a single cylinder 6-inch by 6-inch steam turning engine and a 10-inch by 18-inch reverse engine. The thrust bearings are of the horseshoe type and the propellers are 4 bladed solid about 12 feet in diameter.

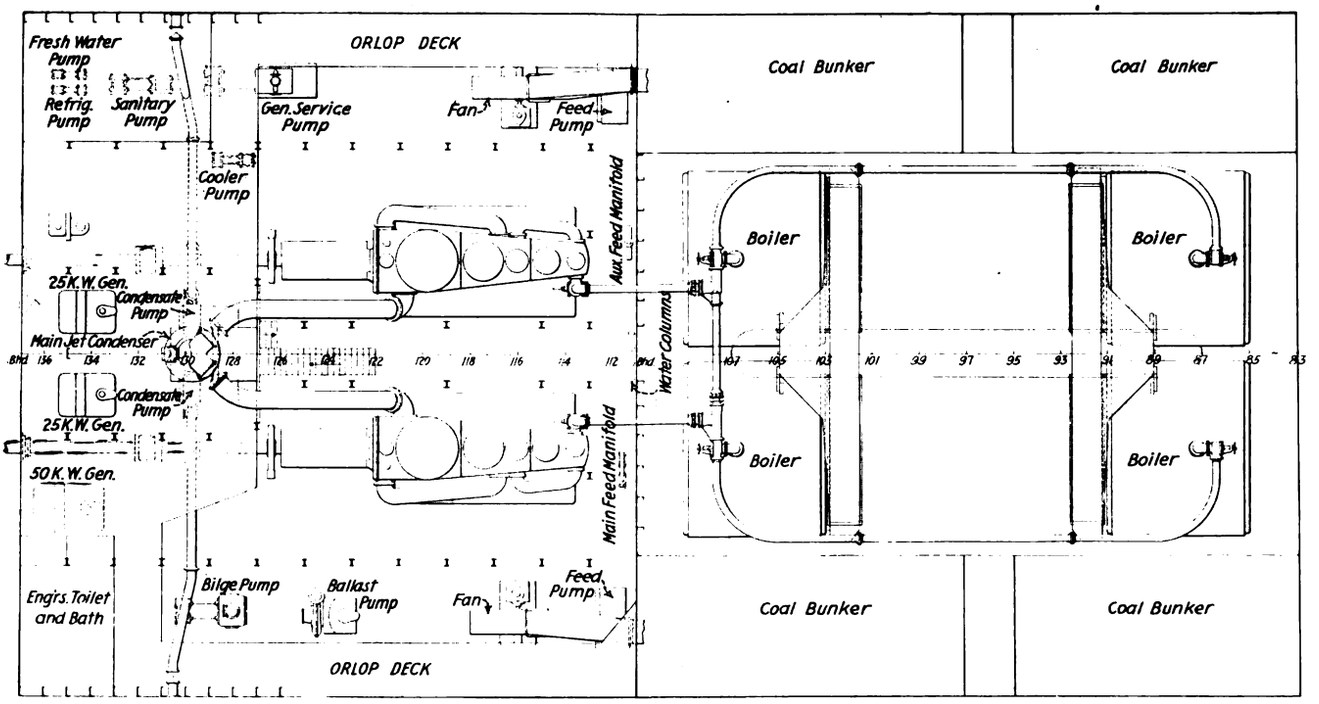
The air pumps and condenser are of the independent type with a jet condenser common to both main engines and fitted with two 6-inch turbine driven condensate pumps. The condensing apparatus was supplied by the Wheeler Condenser and Engineering Company.

Steam is supplied at 185 pounds per square inch by 4 single end 3-furnace Scotch boilers, each having a total heating surface of 2,750 square feet. The boilers are arranged for burning coal under Howden's system of heated forced draft. Air for this system is supplied by two 66-inch fans direct connected to 7-inch by 5-inch vertical engines installed in the engine room. The forced draft equipment was supplied by John Reid and Company, Inc.

### Auxiliaries

The engine room auxiliaries include the following:

1 Morris Machine Works 10-inch centrifugal ballast pump direct connected to a 9-inch by 9-inch vertical engine.
1 Dean horizontal duplex ballast and bilge pump, 8-inch by 10-inch by 12-inch.
1 Dean horizontal duplex general service pump, 10-inch by 5-inch by 12-inch.
1 Dean horizontal duplex feed pump, 10-inch by 6-inch by 12-inch.
1 Dean horizontal duplex cooler pump, 6-inch by 4-inch by 6-inch.
1 Dean horizontal duplex sanitary pump, 8-inch by 5-inch by 12-inch.
1 Dean horizontal duplex refrigerating pump, 4-inch by 2⅝-inch by 5-inch.
1 Dean horizontal duplex fresh water pump, 4-inch by 2⅝-inch by 5 inches.
1 Reilly type D feed water heater.
1 Union Steam Pump Company auxiliary jet steam condenser.
2 2-inch Metropolitan injectors.
2 6-inch Conveyors Corporation of America steam ash guns.




Plan of engine and boiler rooms

## The Largest River Carriers Sixty Years Apart

IN 1866 the art of river steamboat building had reached a high stage of perfection as is clearly indicated by the fact that in that year the now famous steamer *Robert E. Lee* was built. Although there were other excellent steamers, contemporaries of the *Robert E. Lee*, the fact that she won the notable race from New Orleans to St. Louis, June 30 to July 4, 1870, has made her the most famous river steamer of her time.

The *Robert E. Lee* had a length of 297 feet, beam 45 feet and depth of 9 feet. Her propelling equipment consisted of two engines each having a diameter of 40 inches and a stroke of 10 feet. Steam was produced in the old river type boilers as shown in Fig. 3. Each drum was approximately 42 inches in diameter and 30 feet long having two 14-inch flues.

Although these boilers saw severe service on the *Lee*, very high rating being frequently necessary to supply steam to such large engines, it will be of great interest to those studying the length of life of boilers to learn that after they were taken off the steamer in 1882 they were installed at a sugar mill on the Bush Grove Plantation. This is located on Bayou La-Fourche about 2 miles west of Raceland, La., and 45 miles west of New Orleans. Fig. 3 shows three of the drums used on the steamer, another drum has been dismantled and is lying outside of the boiler house. A fifth drum is being used for an oil tank and a sixth is at the Oak Grove Plantation Sugar Refinery some distance from Raceland, where it also serves as an oil tank. Three more are used for liquid storage around the sugar house.

At the sugar mill these boilers were used until about 4 years ago for generating steam necessary for drying the second sugar and until 8 years ago a steam pressure of 80

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**Fig. 1.—The Robert E. Lee discharging 5,741 bales of cotton at New Orleans**

pounds per square inch was permitted for them. This was later reduced to 60 pounds which was carried until the sugar house was shut down.

With these boilers the *Robert E. Lee* established herself as one of the most famous river steamers that has ever existed. In 1873 she carried as a single cargo 5,741 bales of cotton. In Fig. 1, which is reproduced from a very old photograph, this shipment is shown in the process of unloading at New Orleans. The speed of the *Robert E. Lee* in the 3 days and 18¼ hours which it took her from New Orleans to St. Louis, averaged 16½ miles an hour upstream. Another fast run was north

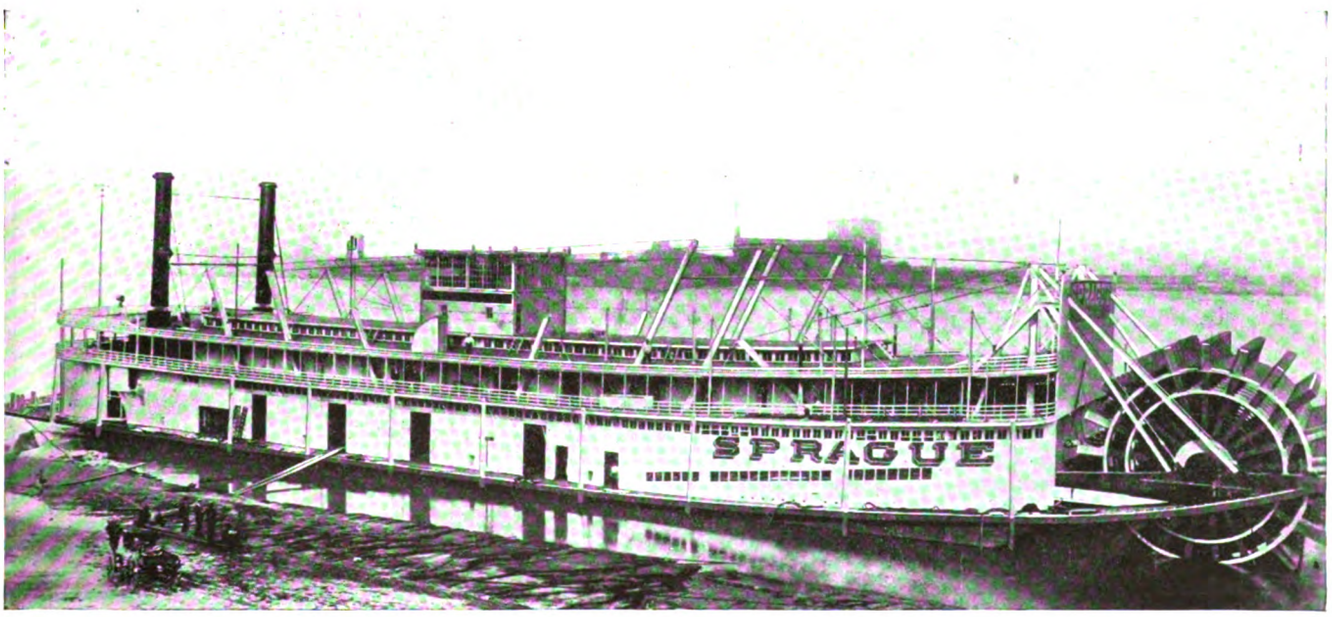


**Fig. 2.—S. S. Sprague, the largest stern wheel towboat in the world**

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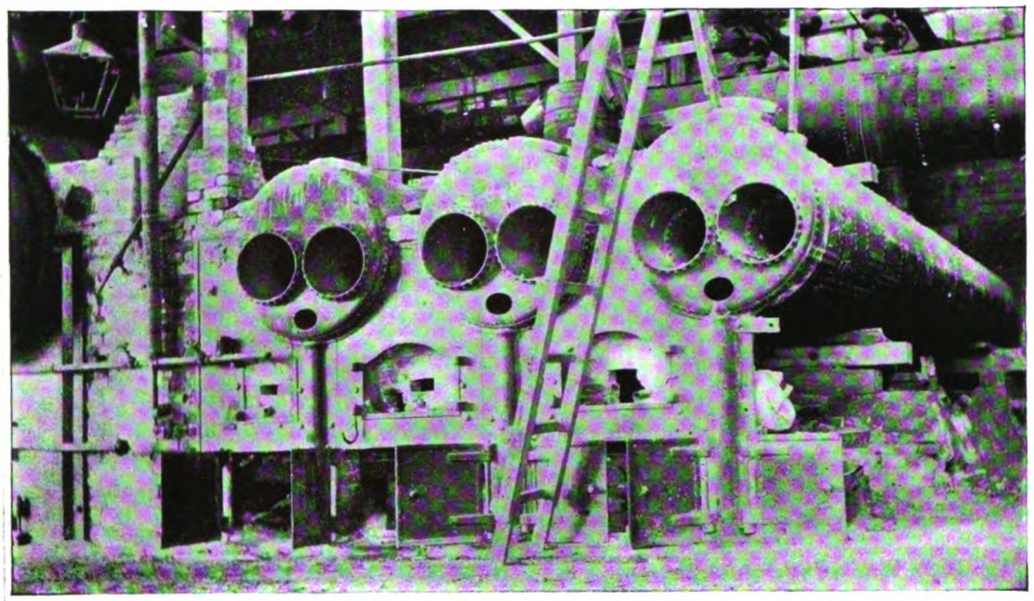

**Fig. 3.—Three of the Robert E. Lee's boilers as they are set up at the present time**

from New Orleans, 390 miles in 24 hours or 16¼ miles per hour average including stops. The boilers of the *Robert E. Lee* were built for high capacity and with little regard for economy. When these boilers were fired with fast burning fuel such as pine knots the smoke and flame poured out of the stacks. We have no records available of the fuel consumption or efficiency obtained in operation, but it is well known that in those days prime importance was not placed upon fuel economy.

In contrast to the *Robert E. Lee* is the steamer *Sprague,* now, by far, the largest stern wheel towboat in the world.

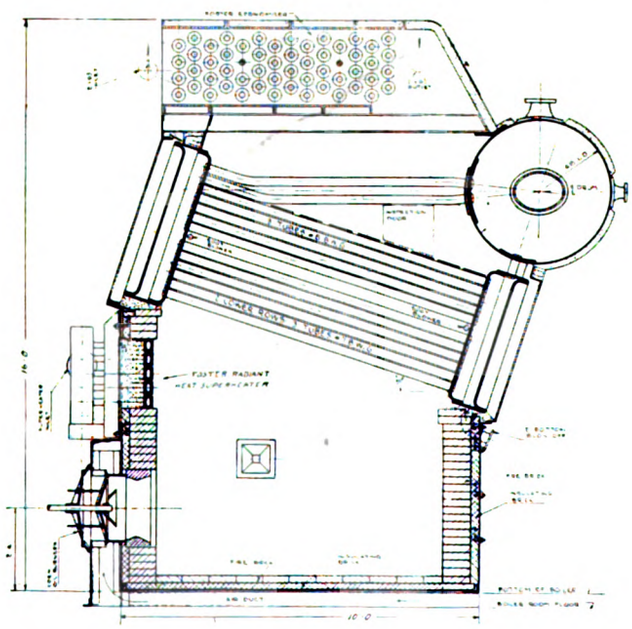

**Fig. 4.—Section of modern, high pressure, watertube steam generator**

The *Sprague* is 315 feet long, has a beam of 64 feet and a depth of 7 feet 6 inches. She is driven by two tandem compound engines with cylinders 28 inches and 65 inches in diameter by 12 feet stroke and her paddle wheel is 37 feet in diameter and 40 feet wide. Steam for the *Sprague's* engines is furnished by 4 Foster steam generators at 250 pounds pressure and her operating conditions are most economical. Her stack temperature is less than 300 degrees, the $CO_2$ is about 12 percent and an overall efficiency of better than 85 percent has been shown.

The boilers are of the general form shown in Fig. 4 and are fitted with radiant heat superheaters and fuel economizers which heat the feed water. Although the *Sprague* is not of the romantic packet class to which the *Robert E. Lee* belonged, she is, nevertheless, the outstanding steamer on the rivers today. In addition to her world's record for marine steam generating efficiency, her world's record size of paddle wheel and other outstanding features, she has the world's record of having handled the most enormous cargo ever moved as a single unit at any time.

It is not unusual for the *Sprague* to include in her tow, practically a quarter of a million barrels of oil at one time. Such a cargo requires an assemblage of oil barges more than 1,100 feet long and 260 feet wide lashed tight together. It is equivalent to 30 train loads of oil tank cars or to a single train 10 miles long. Fig. 2 shows the Sprague tied up at the bank and gives a good idea of her size. Her great proportions are appreciated when compared with the men shown in the picture.

Here then we have an interesting comparison between the propelling equipment of two great shallow draft paddle wheel steamers, one driven by large diameter simple steam engines and crude return tubular boilers containing great weights of water, the other employing compound engines and very efficient watertube steam generators, superheated steam and highly heated feed water eliminating the necessity for great water storage capacity in the boiler. In some quarters it is carelessly stated that "river steamboating" has not progressed and that during the two generations since the *Robert E. Lee* was the finest of her kind nothing better has been produced. No doubt, it is true that speed has not been increased, that more extravagantly equipped vessels are not practicable, but there can be no doubt in the mind of any thinking man that tremendous advances have been made. A steamer such as the *Robert E. Lee,* under present day conditions and prices, could not maintain herself in profitable trade on the rivers. The unthinkable waste of fuel that was given little consideration in those days has been supplemented by a perfection of operation, a reduction in cost of repairs and a saving in weight of steam generating equipment that makes it possible for modern river type transportation to compete with the railroads despite their highly perfected rolling stock and experienced roundhouse personnel.

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# Refrigerated Ships Equipped With Diesel Engines

## The Port Huon and Port Fremantle, 15-knot vessels, with Sulzer and Doxford machinery respectively, for trade between London and New Zealand ports

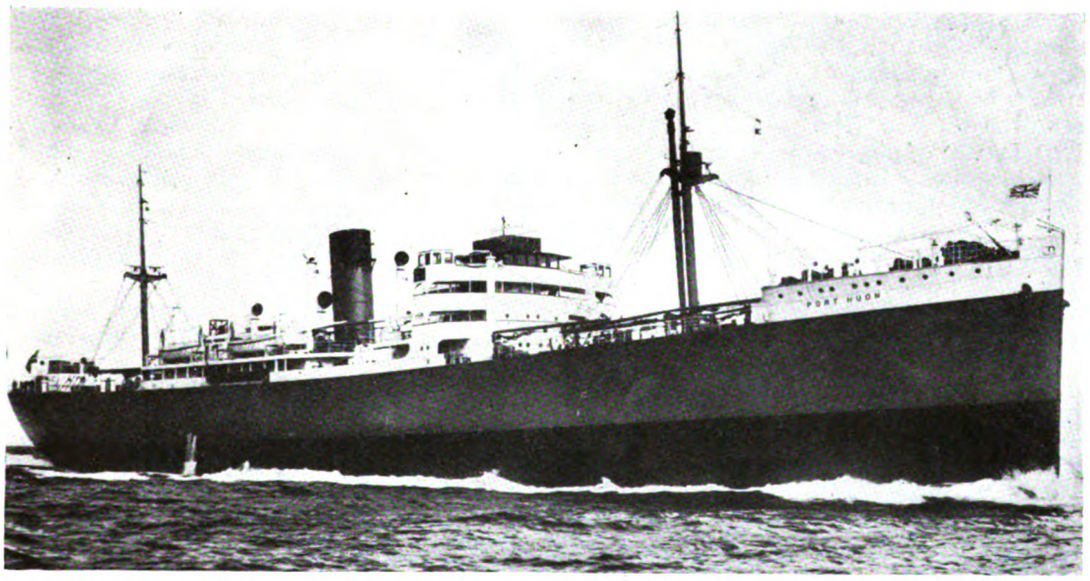
**By Our Special London Correspondent**

SOME doubt has existed in the minds of British shipowners whether, when in need of new vessels designed largely or mainly for the carriage of refrigerated produce, it is desirable to use internal combustion propelling machinery, even though it would appear to show to advantage as compared with steam plant. The reason is that, until comparatively recently, few owners have thought it wise to install electrically operated refrigerated machinery, and if steam plant is fitted for the purpose, it has been preferable to have steam propelling engines. It was partly on this score that the 5 new liners which have recently been built for the Blue Star Line to trade from London to South America, and which carry a good deal of refrigerated cargo, were equipped with geared turbines. It is not without interest, however, to note in passing that the Nelson Line, which competes with the Blue Star Line, lately contracted for 5 vessels of somewhat similar type and approximately the same size but, in these, double acting Diesel engines will be installed.

On the other hand, when the Houlder Line built a new 9,500-ton 15-knot refrigerated ship for service between London and South America, they adopted oil engine propulsion with steam driven refrigerating plant. When the time came to contract for a second similar craft, it was decided to retain Diesel machinery, but to replace the steam refrigerated plant by electrically operated machines. This ship will shortly be placed in service and a sister vessel is under construction for the British and Argentine Steam Navigation Company which is an associated concern of Houlder Brothers.

Two interesting examples of large refrigerated motorships equipped with electrical refrigerating machinery have recently been completed for the regular service of the Commonwealth and Dominion Line (which is connected with the Cunard Line) between London, Australia and New Zealand through the Panama Canal, while a third similar craft will shortly be commissioned. As the owners already have two smaller motorships on the same trade, they will soon have 5 modern internal-combustion engined vessels on this run.

The two new refrigerated freighters are the *Port Huon* and the *Port Fremantle,* and they possess the interest of being similar in dimensions and design but are equipped with machinery of entirely different types—types between which there is now considerable competition in Europe. Both are designed for a speed of between 14½ and 15 knots in service, and while the *Port Huon* has Sulzer two stroke, single acting machinery of 6,000 brake horsepower the *Port Fremantle* is equipped with two Doxford opposed piston engines with an unequal output. The third ship, the *Port Gisborne,* will also have Doxford plant.




**The 11,000-ton, 14½- to 15-knot, refrigerated motorship Port Huon**

The leading particulars of the two ships are as follows:

| | |
|---|---|
| Length overall | 495 feet |
| Beam | 63 feet |
| Depth | 43 feet |
| Deadweight capacity, about | 11,000 tons |
| Service speed, loaded | 14½ to 15 knots |
| Draft, loaded | 29 feet |
| Gross register tonnage | 8,050 |
| Shaft horsepower | 6,000 |

### The Port Huon

Dealing first with the *Port Huon,* this ship has three insulated holds and lower 'tween decks, with accommodation for 150,000 cases of fruit or 165,000 lambs, 6,300 tons of butter or 5,300 tons of cheese. The total insulated space is in the neighborhood of 330,000 cubic feet the refrigerating machinery being of the Hall $CO_2$ type, with two compressors, each driven by a 120 brake horsepower motor.

There is fuel capacity for 1,750 tons and the total con-



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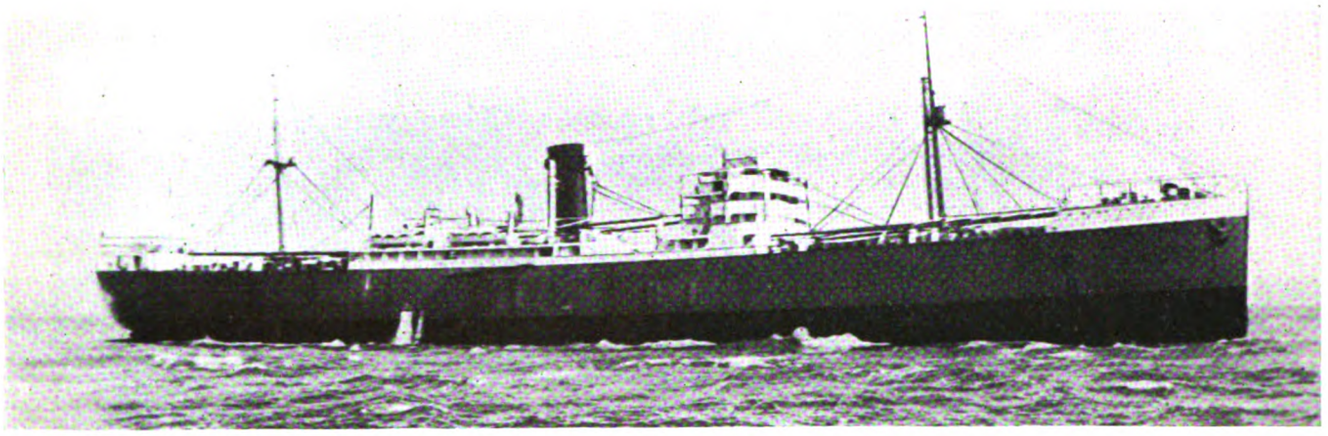

The Port Fremantle

sumption for main and auxiliary machinery at sea is 27 tons per day when averaging 14½ knots fully laden. This enables a voyage from London to Melbourne to be undertaken in 34 days and the oil in the bunkers is practically sufficient for a complete round voyage. It is stated that comparison with existing ships on the same run showed that, if this vessel had been a steamer with oil firing, she would have required 65 tons of oil daily, or if coal fired, 95 tons per day. Possibly, these figures could be improved upon by the adoption of high pressure steam turbines.

The propelling machinery of the *Port Huon* was built under license from Sulzers by the Wallsend Slipway and Engineering Company and comprises two 6-cylinder units of standard type with a cylinder diameter of 680 millimeters and a piston stroke of 1,200 millimeters. It is of interest in passing to record that an 11-cylinder Sulzer engine of similar dimensions has just been ordered by the Hamburg Amerika Line for installation in a new cargo ship, the output being 5,100 brake horsepower.

Several new features have been introduced in these engines, one of which is that the engine controls, instead of being located at the top of the engine, as is usual Sulzer practice, are to be found at the bottom, and, moreover, right at the forward end. This arrangement has never previously been used with motors of the Sulzer class. It involves a new fuel pump drive, which is taken off the crossheads of the injection air pumps. The cam shaft drive is centrally placed instead of at the end of the engine, and beneath the cylinders are lantern pieces through which the piston rod passes so that it is visible.

### Exhaust Gas Boilers

The scavenging blowers are electrically driven by motors running at about 2,700 revolutions per minute and there are one or two novelties in the auxiliary installation. Electric power is supplied from four Burmeister and Wain type 4-cycle generators built by Allans, each developing 400 brake horsepower and coupled to a 250-kilowatt dynamo. The exhaust gases from these auxiliary engines are passed through a boiler to raise steam for heating and other purposes, the steam pressure being in the neighborhood of 100 pounds per square inch. It is to be noted that only the exhaust from the 4-cycle auxiliary engines is used for this purpose as it is considered that the heat in the exhaust from the propelling 2-stroke motors is insufficient to warrant passing it through the boiler.

It is now becoming common on ships to fit centrifugal separators for purifying the fuel oil, and a battery of three units is provided for this purpose and for renovating the lubricating oil in the *Port Huon*. The cargo handling equipment includes 14 electrically operated winches, and the steering gear, capstan and other auxiliaries are electrically driven. Such a completely equipped vessel is obviously a costly ship, but the Commonwealth and Dominion Line have publicly stated that the additional cost of their Diesel-engined craft has been more than warranted by the economy in fuel expenditure.

### The Port Fremantle

The *Port Fremantle* shows no important points of difference in construction and general hull arrangement from the *Port Huon* and the engine room is of practically the same size. The two Doxford units are, however, 4-cylinder engines, with cylinders 580 millimeters bore and a piston stroke of 1,160 millimeters. They run at 97 revolutions per minute to give a total output on twin screws of 6,000 brake horsepower and it may be taken that the fuel consumption is equal to that of the Sulzer-engined ship or possibly slightly lower. The auxiliary equipment is similar, except that only 3 generating units are needed, since one of those in the *Port Huon* is required solely for the purpose of supplying electric power to the scavenging blowers, which are not utilized in the Doxford engine. The usual arrangement is employed of having the scavenging pump, between the two pairs of cylinders, driven direct off the crank shaft.

Both the *Port Huon* and the *Port Fremantle* have accommodation for a dozen passengers, four of them being berthed in single cabins. It goes without saying that on long distance routes, such as that upon which these vessels will be engaged, the oil engine possesses special advantages for propulsion, a fact which is emphasized by the orders which have recently been placed by other owners whose vessels operate to New Zealand. The Shaw, Savill and Albion Line has 4 passenger and cargo vessels of 9,500 tons gross under construction, all to be equipped with 7,800 brake horsepower Sulzer machinery, while the New Zealand Shipping Company has contracted for two 15,000-ton passenger and cargo liners, also with Sulzer-type machinery, to maintain an average speed of about 15 knots. All of these vessels will have a considerable amount of refrigerated space.

## U. S. Lines Show a Profit

THE United States Lines showed a direct profit from operations of $635,842.97 during the fiscal year ended June 30, according to a statement submitted to the Merchant Fleet Corporation on July 21. After deducting the proportion of Fleet Corporation overhead expenses assigned to the lines, the net profit was $371,085. This is compared with a net loss of $645,000 during the preceding fiscal year, or a net gain of $1,016,086 in operating results.

During the fiscal year, 61 voyages were terminated, 83,756 passengers and 274,894 tons of cargo transported.

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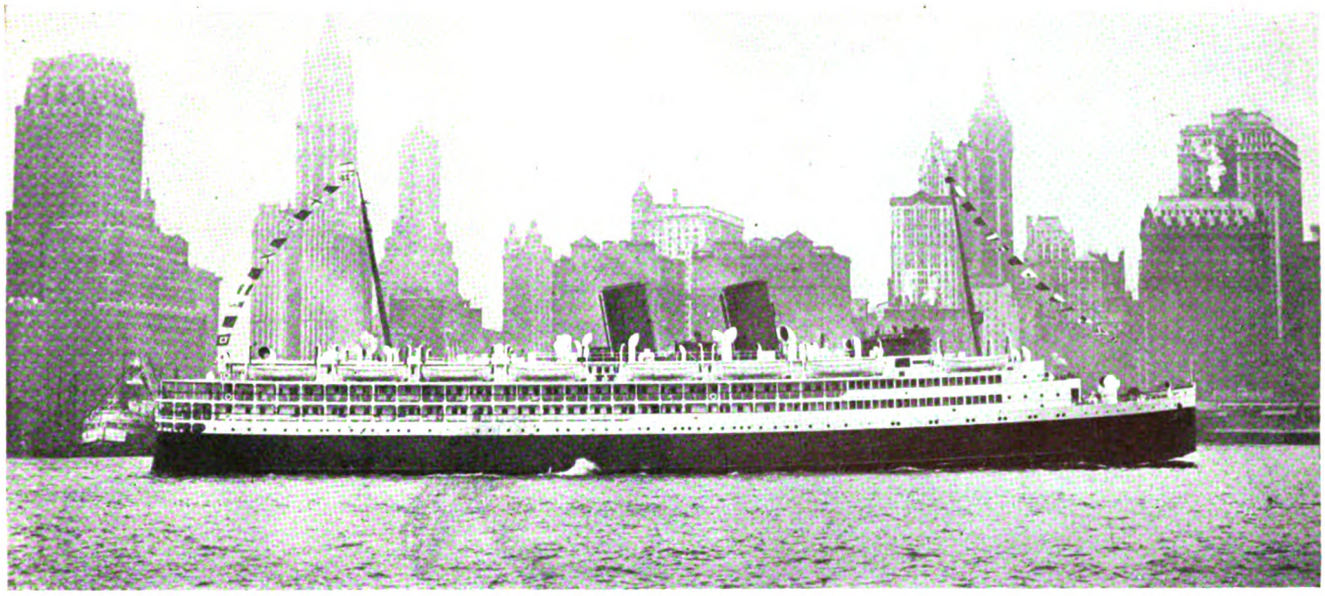

Clyde liner Iroquois leaving New York on vacation cruise

# Interior Views of New Clyde Liner Iroquois

SUPPLEMENTING the plans and description of the new Cylde liners *Iroquois* and *Shawnee,* published on page 375 of our July issue, we are enabled through the courtesy of the Clyde Steamship Company, New York, to reproduce on the following pages a number of photographs showing interior views of the *Iroquois.* It will be recalled that this vessel and her sister ship, the *Shawnee,* were built by the Newport News Shipbuilding and Dry Dock Company, Newport News, Va., in accordance with plans and specifications prepared by Theodore E. Ferris, naval architect, 30 Church street, New York. These fine new vessels, costing approximately $2,300,000 each, are 407 feet 3 inches long overall, 62 feet beam and 30 feet 6 inches depth. At a draft of 18 feet 6 inches they have a displacement of 7,560 tons. Accommodations are provided for 640 first class passengers and 114 steerage passengers.

Glass enclosed promenade deck

Outside stateroom with connecting bath



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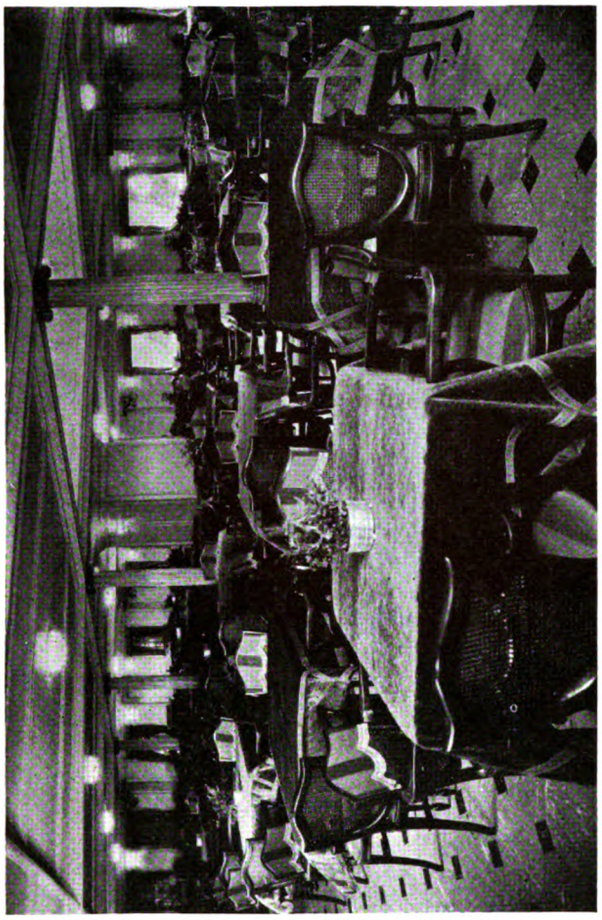
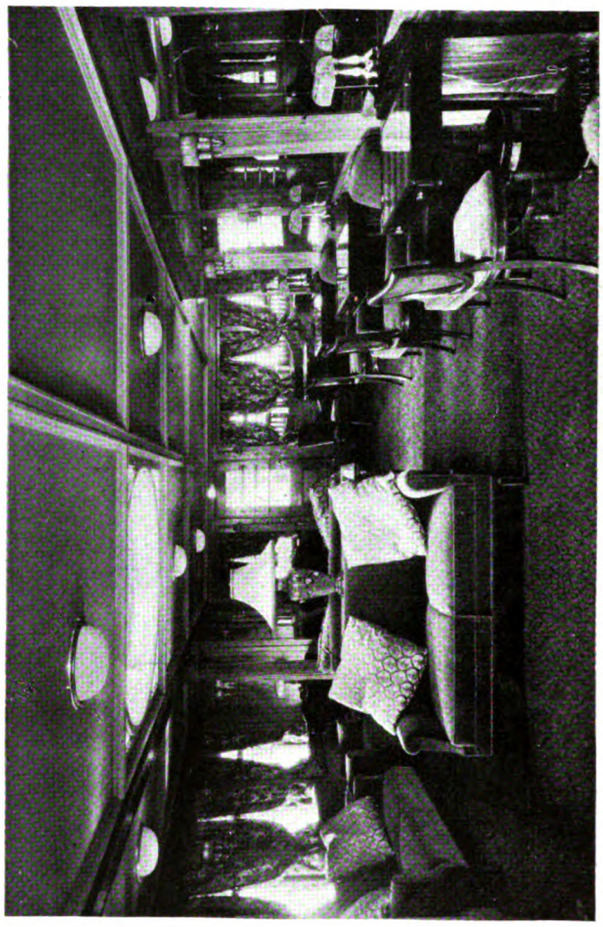
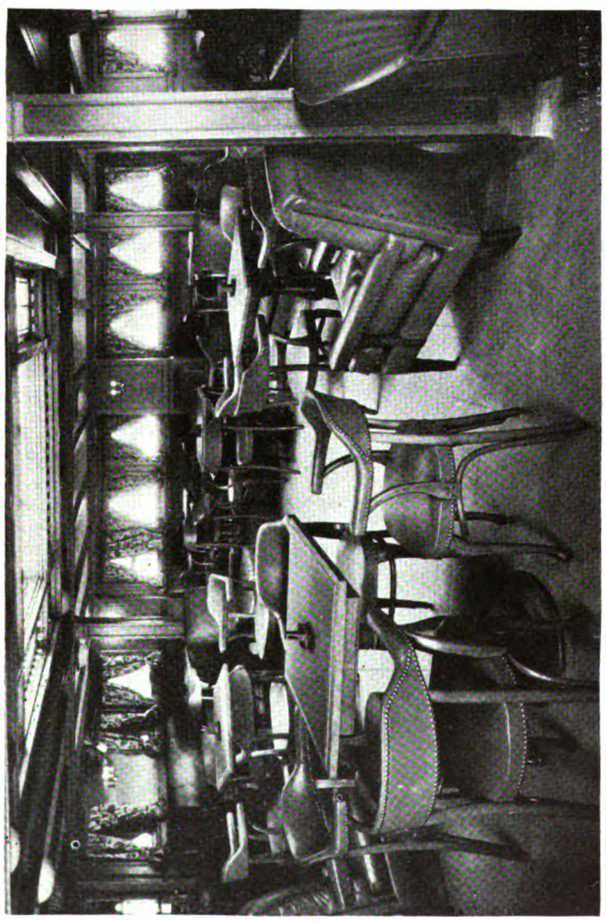


Dining room



Writing room



Smoking room

Lounge and music room

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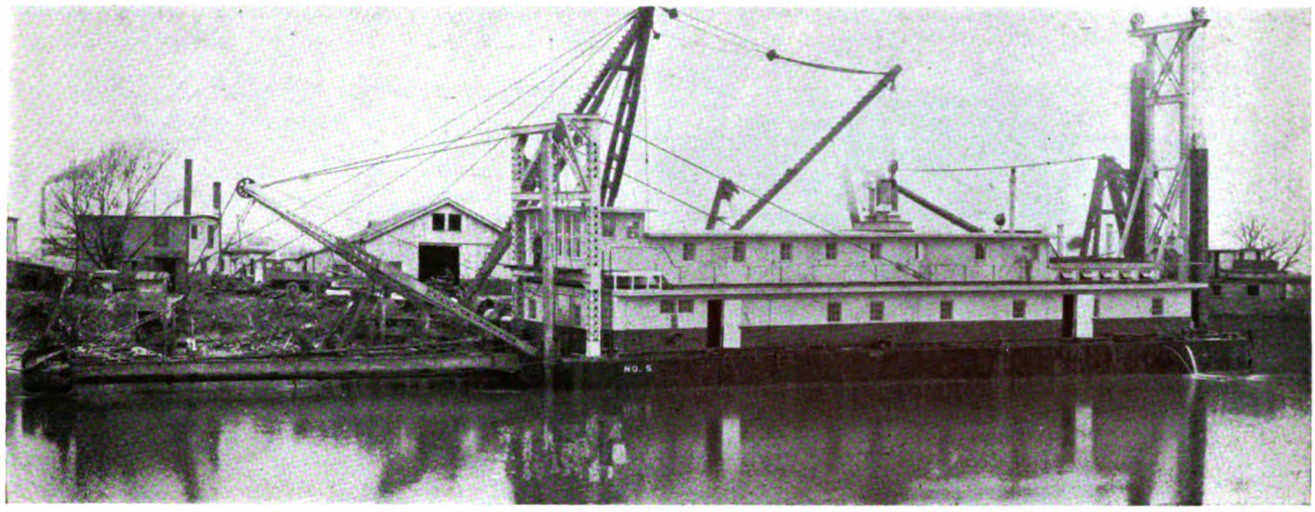


Diesel electric hydraulic dredge

# Heavy Duty Diesel Electric Hydraulic Dredge

## Designed by Chapman and Fisher Company, Inc., for the Delaware Dredging Company

THE Delaware Dredging Company, 139 South Third street, Philadelphia, Pa., has recently added to its equipment a heavy duty 15-inch Diesel-engined electric hydraulic dredge costing about $230,000, designed by the Chapman and Fisher Company, Inc., consulting engineers and naval architects, 524 Walnut street, Philadelphia. The main particulars in the dredge are as follows:

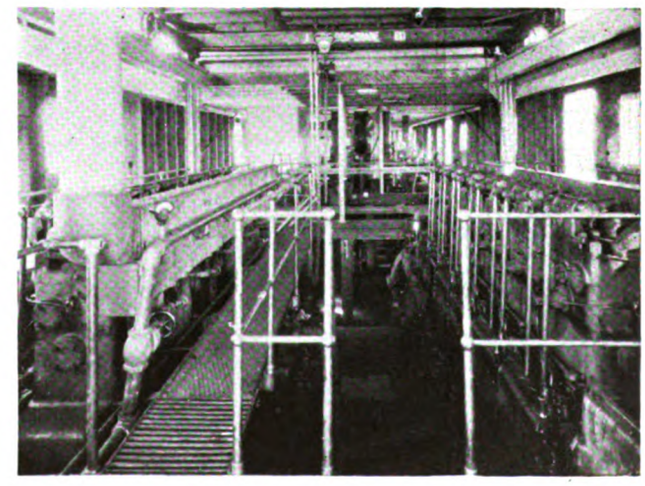
| | | | |
|---|---|---|---|
| Length overall | 115 feet | | |
| Beam over sheathing | 34 feet | 8 | inches |
| Depth, inside, molded | 9 feet | 11 | inches |
| Depth overall | 10 feet | 8 | inches |
| Draft, forward | 6 feet | 7 | inches |
| Draft, aft | 5 feet | 4½ | inches |
| Draft, mean | 5 feet | 11¾ | inches |
| Displacement | 670.52 tons | | |
| Weight of hull | 265.4 tons | | |
| Weight of machinery and equipment | 353.37 tons | | |
| Weight of fuel, water and stores | 51.75 tons | | |
| Diameter of suction and discharge | 15 inches | | |
| Capacity, about | 490 yards per hour | | |

The hull, which is of wood, is built for heavy duty with 12-inch sides and steel reinforcing for the machinery foundations. All fittings are of heavy cast steel. As shown by the plans, the machinery on the main deck is enclosed by a wooden house, 25 feet 6 inches wide by 100 feet long, above which are accommodations for a crew of 18. The quarters include 10 staterooms, each with running water, and a mess room and galley aft equipped with an electrically operated frigidaire cold storage unit.

The operating and living quarters are heated with a Davis exhaust gas heater operating a hot water system.

The hull is equipped with an 18-inch spud forward controlled by an arm from the mast and two 24-inch spuds aft. The ladder, which is constructed of 18-inch H-beams stiffened, is 55 feet long from the center of the pinion to the cutter head. It is controlled by a latticed steel A-frame boom which is supported by 2-inch steel cables extending over latticed steel masts 25 feet above the deck. The after

Pump room



Engine room



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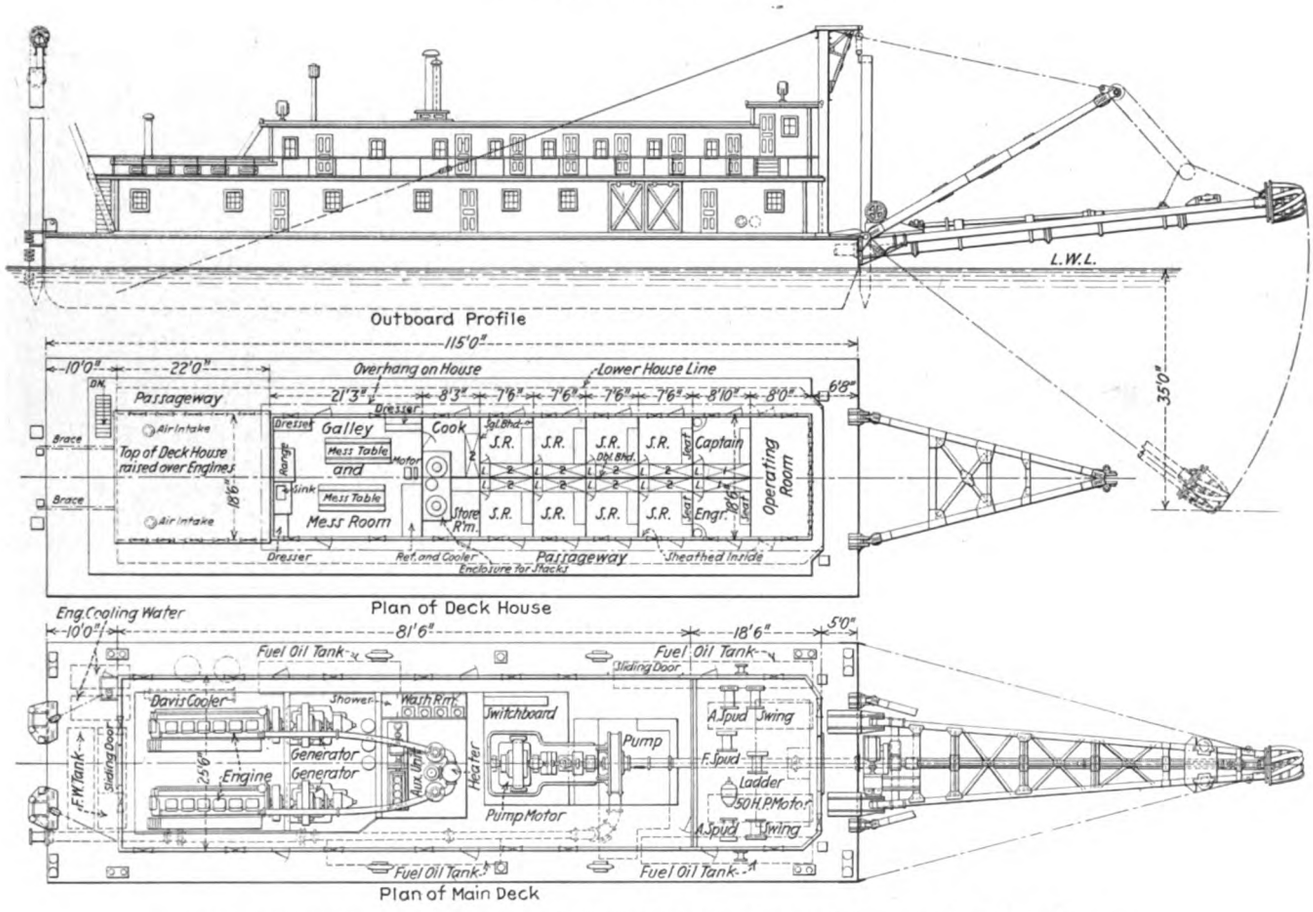
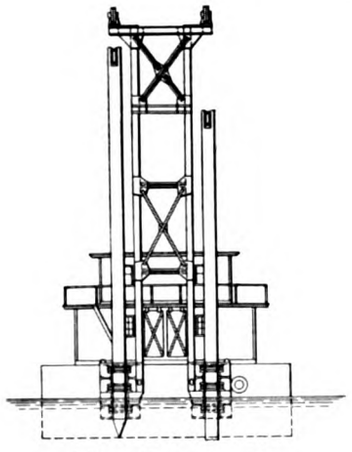



**Profile and deck plans of Diesel electric dredge built for the Delaware Dredging Company**

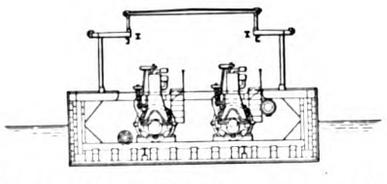
spuds are handled by 50-foot latticed steel masts with fair leads at the top.

Current for operating the dredge is supplied at 250 volts by two 250-kilowatt Westinghouse direct current generators each driven at 277 revolutions by a 400 horsepower De La Vergne 6 cylinder, 4 cycle, solid injection Diesel engine of 14½-inch bore and 18-inch stroke. The cylinders of these engines each have two spray valves which spray into a combustion chamber on an angle. Since with this type of construction the pistons are not exposed to direct heat, piston cooling is eliminated. The cylinder head is of simple design containing only the injection air and exhaust valve cages which are interchangeable and removable. It is of interest to know that the spray valve may be removed without shutting down the engine. This is accomplished by simply pulling the oil pump cut-out handle on the cylinder and, while the load is taken on the other cylinders, the spray valves are removed with a spanner wrench. The lubricating oil system is of the constant pressure type so arranged that in case of failure of any part of the distributing system the engine will shut down automatically, thus preventing a burned out bearing. For keeping the circulating water for the main engines at the proper temperature, a Davis cooler is fitted capable of supplying 160 gallons of water per minute cooled from 125 degrees to 85 degrees when supplied with 480 gallons of cooling water per minute at 75 degrees Fahrenheit.

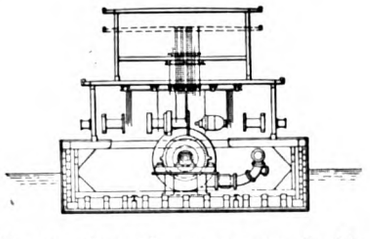
The suction pump is of the centrifugal type with overhung impeller fitted with Goodrich cutless bearings. The pump is driven by a 600 horsepower Westinghouse 500-volt motor operating at from 225 to 275 revolutions per minute. The cutter head is driven by a 60 horsepower 500-volt motor operating at 900 revolutions per minute installed at the base of the ladder and driving the cutter head through a De Laval reduction gear attached to a cast steel spur gear reduction, reducing the speed of the cutter head to 18 revo-



**Aft endboard profile**



**Section through engine room, looking forward**



**Section through pump room looking forward**

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lutions per minute. A Kingsbury thrust bearing is fitted to prevent the wear of the shaft from dis-alining the reduction gear.

For operating the ladder and spuds, a 50 horsepower Westinghouse motor is connected to a Lampbert swinging unit. The operating levers are installed in the pilot house with the necessary vacuum and indicator gages for determining the condition and operating efficiency of the various units.

The auxiliaries include a 3-inch Warren centrifugal fire pump driven by a 15 horsepower motor; a 1½-inch centrifugal circulating pump driven by a 5 horsepower motor; a 1-inch centrifugal motor-driven hub pump and four 1-inch centrifugal motor-driven bilge pumps. The auxiliary unit consists of a 35 horsepower Hill Diesel engine compressor and generator unit.

The weight of the machinery and equipment complete is about 410 tons, including 12,000 gallons of fuel oil.

## French Liner Ile-de-France Completes Maiden Voyage

THE new French liner *Ile-de-France,* which is the largest post-war vessel in the world, sailed on May 29 from the Penhoet yards where she was built and after being dry docked in the Brest naval dockyard, proceeded on her speed trials, on which a speed as high as 24 knots was attained at about 234 revolutions per minute. The designed speed was 23.5 knots. The ship arrived at Havre on June 5 and the completion of the passenger accommodations was proceeded with until June 16, 17 and 18 when the vessel was open for inspection for three days. She sailed on June 22 on her maiden voyage, arriving at New York on June 28. The average speed worked out at about 23 knots, so it may be assumed that the service speed of the vessel will be from 22.5 to 23 knots, which is higher than that of the *Paris* and of the *France.*

Considerable interest attaches to the successful performance of the Prudhon-Capus accelerated circulation boilers on the *Ile-de-France,* as this is the first time this type of boiler has been installed on such a large liner. The condensers of the *Ile-de-France,* unlike those of the *Paris,* are of a novel type known as the Delas patent.

That British industry contributed largely to the construction and fitting out of the *Ile-de-France* is shown by the following equipment on the vessel: Stone watertight doors and propellers; S. G. Brown gyro-compass, automatic helmsman and electro-megaphones; Brown Bros. telemotor; J. H. Wilson electric cargo winches; Kelvin compasses and sounding machines; White patent oil-burning equipment; Beardmore furnaces; James Howden forced draft; Allen Everitt condenser tubes; Cumberland electrolytic system; Pneumercator tank gages; Kirkaldy evaporators; Shanks sanitary appliances; Thermotank ventilation system, etc. This is a proof that in spite of the high prices resulting from the depreciation of the franc, French shipowners are continuing to place many orders with British sub-contractors for reasons of greater reliability, or quicker delivery.

It is understood that the French Line will have to order shortly a further liner for the New York line. The new vessel will probably be somewhat larger than the *Ile-de-France,* and will be placed into service not later than 1932. The company will also have to order in the near future several other liners for the New York and the Central America services. Such orders were announced by Mr. Dal Piaz, chairman of the board, in a speech delivered on June 8 at the general meeting of the shareholders of the company. In the course of the report of the directors an interesting allusion was made to Diesel drive. The report stated that in view of the difficulties of the moment, the firm had found itself prevented from ordering new tonnage and making a first practical experiment with Diesel drive, but it is hoped that this experiment shall be made shortly as studies are being carried out in this direction. This means that the French Line will shortly either order motorships or have some steamers converted to Diesel drive.

## French Shipyards in a Serious Condition

OWING to the lack of orders for new ships during recent months the position of most of the French shipbuilders has become serious. Outside of the orders placed by the French Navy for a few warships, the only order received during the last 6 months has been that for two 600-ton submarines placed by the Serbian Government with the Ateliers et Chantiers de la Loire. These submarines are fitted with German-built M. A. N. engines.

In view of this complete stoppage of orders, launching operations in French yards have become infrequent. On May 28 there took place at the Penhoet yard the launch of the Norwegian motor cargo vessel *Téméraire.* This firm is about to deliver also to Norwegian owners the big motor cargo vessel *Benjamin Franklin.* The building of a number of Norwegian motor cargo vessels fitted with Burmeister and Wain engines built at Penhoet under license is a feature of the activity of the Penhoet Company.

On May 31 there was launched from the Saint-Nazaire yard of the Ateliers et Chantiers de la Loire the Belgian passenger steamer *Albertville* intended for the Antwerp-Belgian-Congo service.

The Cie Sud-Atlantique which has been for years operating the mail service from Bordeaux to Brazil-River Plate with with only two liners, the *Lutetia* and *Massilia,* and which is badly in need of two new liners, has decided to have these two vessels converted from coal to oil burning. The *Lutetia* is to be converted to oil burning on the Wallsend-Howden system at Penhoet from July to October, her accommodations being thoroughly reconditioned. The *Massilia* will be dealt with later on. As to the new 25,000-ton liners, it is understood that they will be ordered shortly from two French yards, provided a solution is arrived at as regards the State assistance.

Nothing has yet been done in connection with the long planned assistance to be given to shipbuilding in France, although the difficult conditions of this industry are calling for urgent steps. The only measure under consideration is the custom exemption on imported articles and materials for shipbuilding, that was approved on May 13 by the Chamber of Deputies and embodied in the bill providing for the general revision of French custom tariffs. This measure has still to be approved by the Senate. The above exemption will apply only to raw materials such as steel plates and sections, custom duties being maintained—and even increased—on all engines, boilers and machinery parts.

LIGHTHOUSE TENDER BEECH LAUNCHED.—The United States lighthouse tender *Beech* was launched on July 21 by the Southern Shipyard Corporation, Newport News, Va. She is a single screw steel vessel 101 feet 3 inches long overall, 21 feet molded beam with a designed mean draft of 6 feet 6 inches. Propulsion is by a 200 indicated horsepower triple expansion steam engine, supplied with steam at 200 pounds by an Almy watertube boiler. All auxiliary machinery is operated at full boiler pressure, including a 4-drum hoisting engine. The vessel is equipped with a 20-ton A mast and derrick and is as nearly fireproof as possible.

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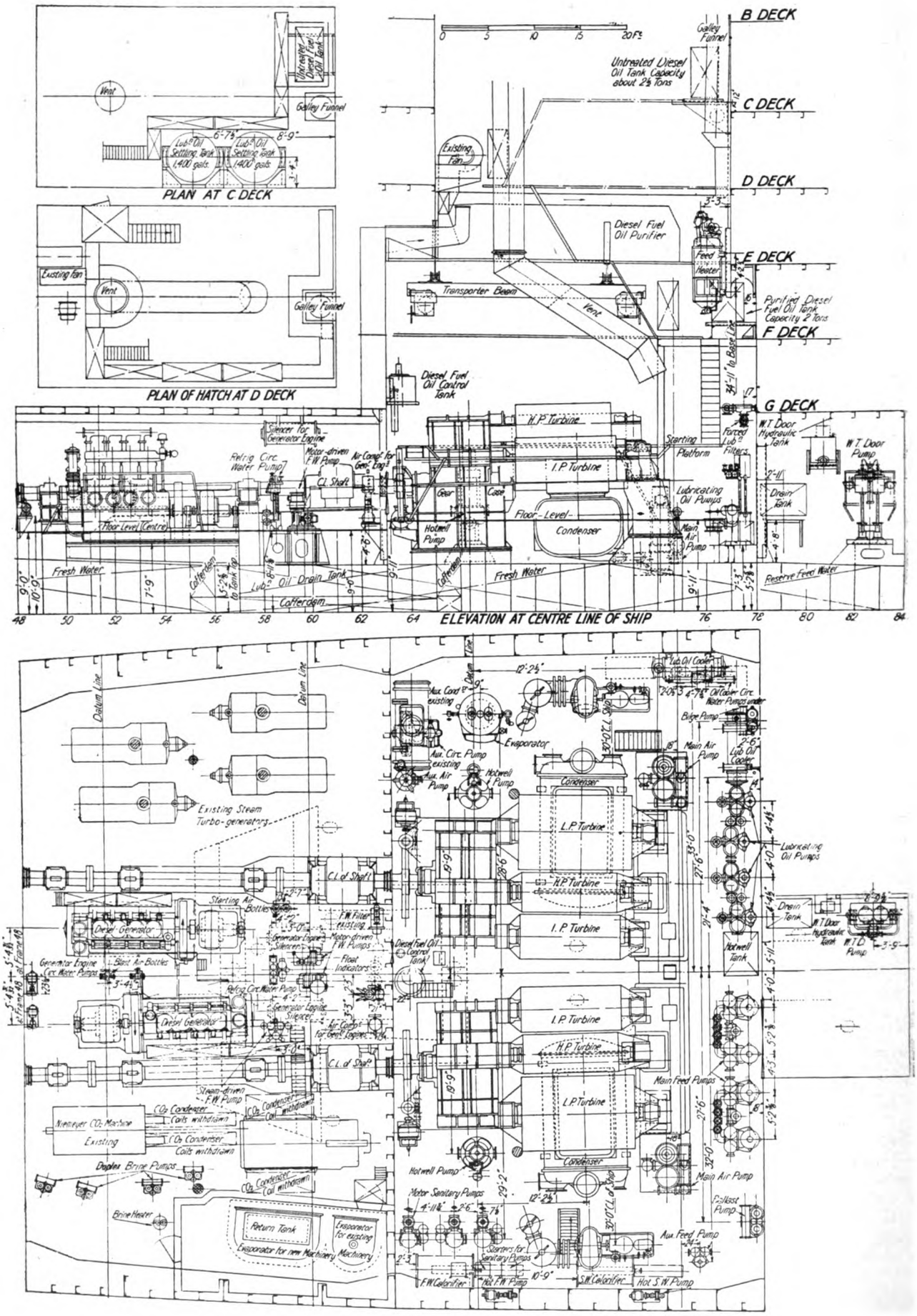


**Arrangement of propelling machinery, S. S. Empress of Australia**

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# The Reconstruction of the Empress of Australia*

## New machinery increases speed of vessel 3 knots with remarkable reduction in fuel consumption

ONE of the most important contracts ever carried out on an existing vessel has just been completed by the Fairfield Shipbuilding and Engineering Company, Limited, of Govan, Glasgow, on the large twin screw passenger liner *Empress of Australia*, of the Canadian Pacific Steamships, Limited.

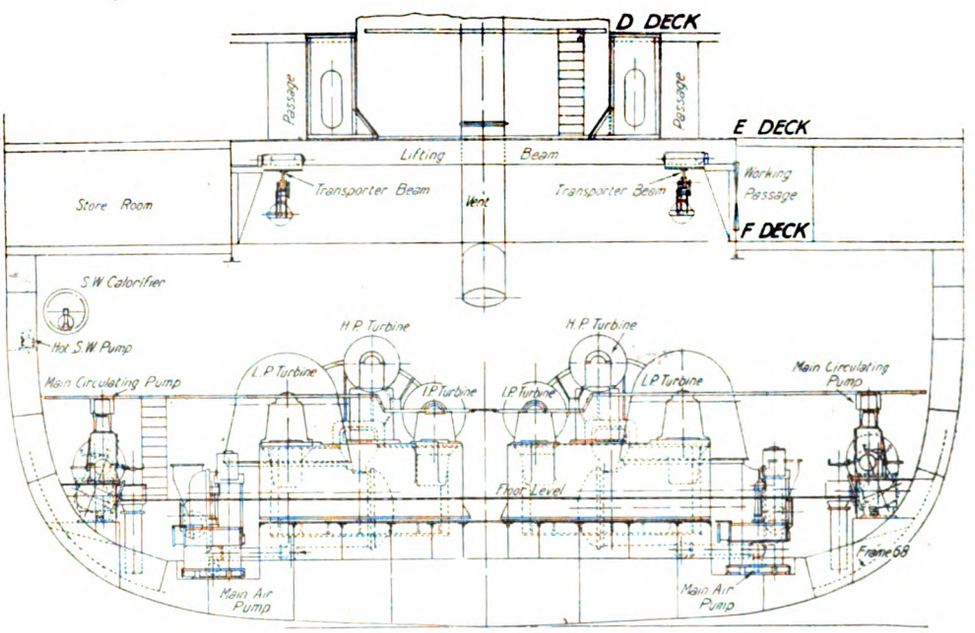
Formerly the steamship *Tirpitz*, built in Germany to the order of the Hamburg-American Line, the construction of the vessel was contracted for prior to the Great War, but was suspended during hostilities. After the Peace Treaty, the partly constructed ship was taken over by the British Government and ultimately purchased by the Canadian Pacific Company for their service on the Pacific. Her leading particulars are as follows:

| | |
|---|---|
| Length overall | 615 feet 0 inches |
| Length between perpendiculars | 588 feet 0 inches |
| Breadth molded | 75 feet 0 inches |
| Depth molded to *D* deck | 46 feet 2¾ inches |
| Gross tonnage | 21,861 |
| Net tonnage | 12,292 |

The original propelling machinery was entirely novel, and it was believed to possess many desirable features for ship propulsion, particularly as regards the absence of astern-running steam turbines. It comprised two independent high speed impulse reaction turbines driving twin propellers through Föttinger hydraulic transformers. Steam was supplied by 14 oil-fired watertube boilers of a modified Yarrow type working under forced draft. The designed shaft horsepower was 14,500, and was intended to give the vessel a speed of 17 knots. Unfortunately, however, this machinery on service in the Pacific did not prove very satisfactory, as the owners were unable to obtain the anticipated speed, and the consumption of fuel was very high.

Consequent on the decision to transfer the ship from the Pacific to the North Atlantic service and to adapt her for extensive world tours, which made a higher speed desirable, the owners considered it would be advantageous to install entirely new engines and boilers. At the same time it was decided to make very considerable alterations to the passenger accommodation in order to fit the vessel for her new service.

The new propelling machinery, constructed and installed by the Fairfield Shipbuilding and Engineering Company, Ltd., consists of two independent sets of Parsons geared turbines, each set having one high pressure, one intermediate pressure and one low pressure turbine, and driving a propeller shaft through single reduction gearing. Each turbine drives through an independent pinion. The complete installation has been designed to develop a combined power of 20,000 shaft horsepower on service with the propellers running at 125 revolutions per minute, provision being made for an overload of 21,000 shaft horsepower. In the intermediate pressure and low pressure turbine casings there are incorporated a high pressure and a low pressure astern turbine respectively, designed to give a total astern power of 14,000 shaft horsepower. Provision is also made for supplying steam direct to any of the turbines in case of necessity.




**Section at frame 71, looking aft**

The two main condensers, of the regenerative type, have been supplied by Messrs. G. and J. Weir, Ltd., Glasgow. They have been designed for very high vacuum, and the tubes are of cupro-nickel. The condensate leaves the condenser at the temperature of the entering steam, whereas in normal condenser performance there is a temperature drop of 10 or even 15 degrees F. The surface which functions as an air cooler is self-adjusting; i.e., if the leakage be large, a large portion of the surface at the top of the condenser functions as an air cooler, while if the leakage be

* Abstract of article in *The Shipbuilder*.



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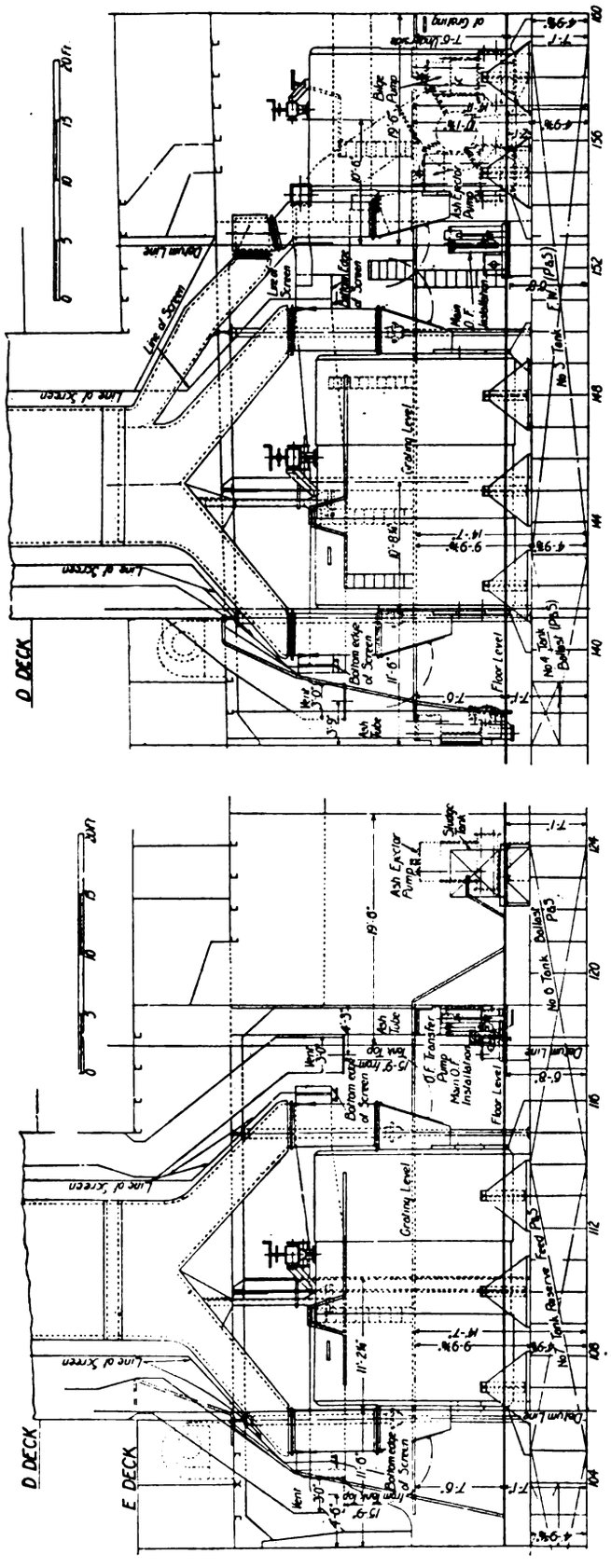
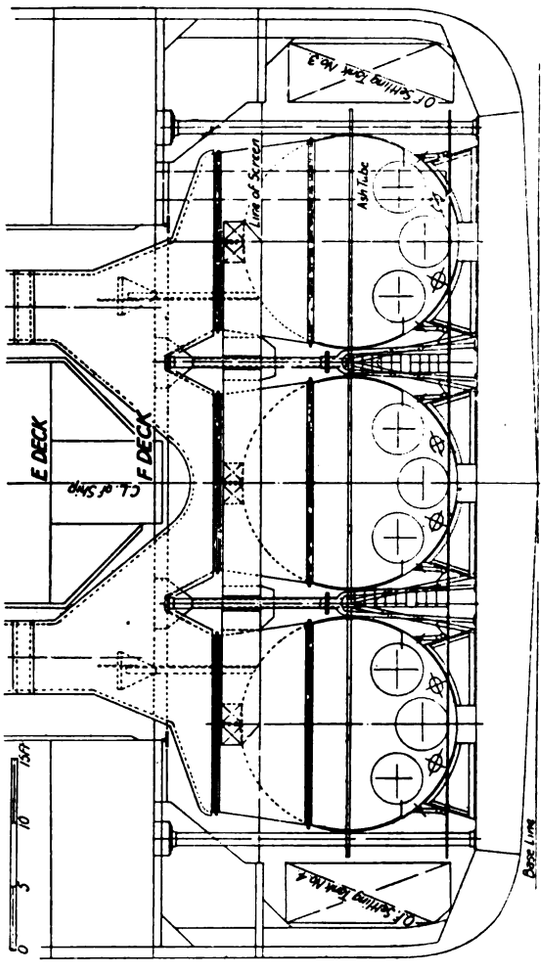



Arrangement of after and forward boiler rooms




Section through after boiler room at frame 115, looking aft

small only a small portion acts as such. The condensate, being at the vacuum temperature, contains no air in solution, and is therefore non-corrosive.

In the seating for the turbines and gearing a radical departure from standard practice has been adopted; and in place of building plate and angle bar stools as usual for this type of machinery, the gear case has been extended downwards and constructed with a flat base, thus providing a well distributed foundation for attachment to a comparatively shallow box seat built on the tank top. The turbines, as usual in geared installations, are situated a considerable height above the tank top, necessitating high erections for their support. A massive cast iron stool has been fitted at the forward end, to embrace the feet of each set of turbines. This cast iron stool sits direct on the tank top, dispensing entirely with the usual plate and angle bar structure.

In connection with other ships under construction for his company, Mr. J. Johnson, the owners' chief superintendent engineer, has shown himself to have the courage of his convictions in giving effect to bold engineering conceptions where the slightest gain in economy may be anticipated. As evidence of this in the *Empress of Australia*, and as the result of tests carried out to his instructions at the William Froude Tank of the National Physical Laboratory, it was decided to alter the rotation of the propellers, which previously were outward turning, and to arrange these to turn inward when going ahead, the tank experiments having shown that an appreciable gain in propulsive efficiency would be effected. The results of the sea trials, which will be referred to later, have fully borne out this anticipation.

The main thrust blocks, which are of the Michell type, have incorporated with them thrust indicators, so that a very complete analysis of the ship's performance on trial could be obtained, and in this connection an electrical Ford torsionmeter of the latest design was fitted to each line of propeller shafting.

The new propellers, which are of the four bladed, solid

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type, have been supplied by Messrs. J. Stone and Company, Ltd., of London.

The boiler installation consists of six double-ended cylindrical boilers, designed for a working pressure of 220 pounds per square inch and fitted with superheaters, supplied by the North Eastern Marine Engineering Company, Ltd., to give a superheat of 240 degrees F. at the boilers. These six boilers are arranged in two boiler rooms, three abreast in each. In addition, a single-ended boiler, designed for the same working pressure, is fitted on the centerline forward in the forward boiler room, for the purpose of supplying steam to the auxiliary machinery, and this boiler is also connected to the main steam range.

The double-ended boilers work under Howden's system of forced draft, four electrically driven fans having been installed for this purpose. The air ducts are so arranged that the resistance is reduced to a minimum and the air led to the furnaces in the most efficient manner. Extra large air heaters, of Messrs. Howden's tubular triple circulation type, are fitted to the double-ended boilers, and these are designed to recover the maximum heat from the escaping gases.

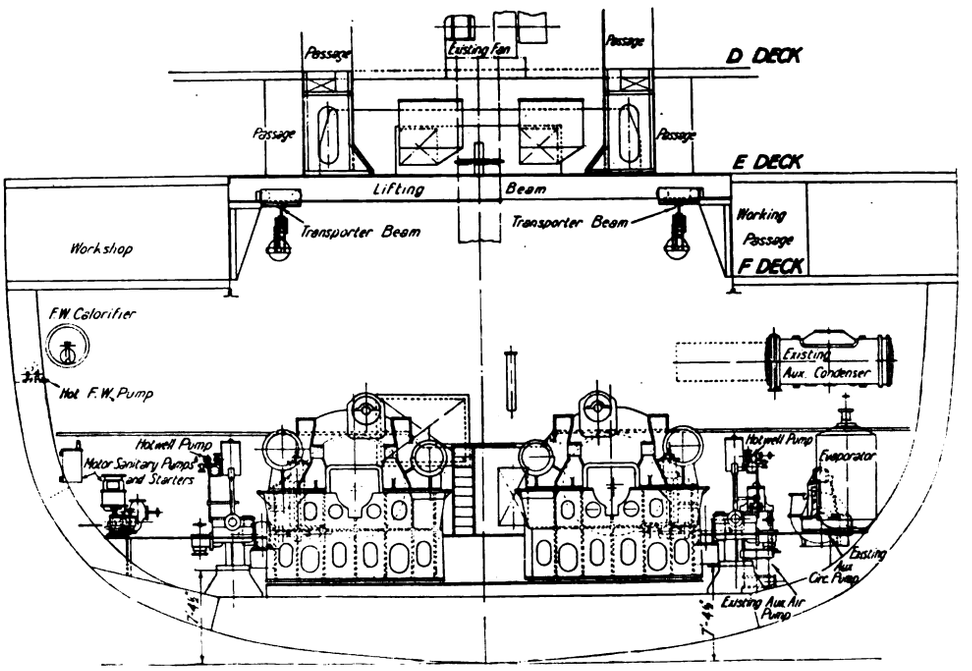
The oil fuel burning equipment for the seven boilers has been supplied by Todd Oil Burners, Ltd., of London, and consists of two duplex pumping and heating sets, one fitted in each boiler room. Each set has two fuel pressure pumps, three heaters, suction and delivery filters, and automatic control. A small harbor oil fuel unit, which is entirely independent of the two main units, has also been supplied by the company named, and this is situated in the forward boiler room adjacent to the auxiliary boiler.

An interesting feature of the work was the removal of the original boilers and the installation of the new ones. This was accomplished without any disturbance of the accommodation over the boilers being lowered through a hatch forward and skidded aft to their appointed positions.

The four turbo-driven generators originally fitted in the ship have been retained for use in case of emergency; and for normal service conditions two Diesel engine-driven generators, each of 165 kilowatts, have been installed in the after engine room. These Diesel generators are of sufficient capacity to deal with the whole of the ship's ordinary service as well as with the new motor-driven auxiliary machinery which has now been fitted, and a very appreciable saving in the consumption of fuel for auxiliary purposes has resulted.

Very complete protection against fire is provided by an equipment of "Foamite" extinguishers.

The machinery was thoroughly tested during a series of sea trials. On the measured mile a mean speed of 20.345 knots was obtained, and during the extended trial at 20,440 shaft horsepower the consumption of oil fuel was 0.69 pound per shaft horsepower per hour for the main and auxiliary machinery, including steering gear, but excluding deck services. This performance corresponds to an aggregate consumption of 150 tons of fuel oil per day for all purposes at a speed of 19 knots in good weather.




**Section at frame 65½, looking aft**

During a previous full power trial with the original machinery, the maximum speed recorded was 17.2 knots, and the best sea speed on a number of voyages was 16.5 knots on a gross consumption of 205 tons of fuel oil per day.

The economy obtained by the new machinery and propellers is best illustrated by comparison of the fuel consumptions at the previous service speed of 16.5 knots. On this basis the consumption of fuel oil with the new installation would be 100 tons per day, i.e., rather less than half the consumption required with the original machinery.

The completion of this large machinery installation, as well as the successful running of the trials, in a period of five months after obtaining delivery of material, is a feat which has probably never before been attempted or accomplished in the history of marine engineering.

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SALE OF PACIFIC STEAMSHIP LINES POSTPONED.—The Shipping Board has postponed action on proposals to advertise three Pacific Coast cargo services for sale until October, pending a report from the Merchant Fleet Corporation on the general trans-Pacific rate situation. The lines involved are the American Australia Orient Line, the Oregon Oriental Line and the American Oriental Mail Line. These three lines have a total of 41 vessels aggregating about 375,000 tons.

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# Vertical Boring and Turning Mill

A LARGE vertical boring and turning mill has recently been completed by the Niles Tool Works Company, Hamilton, Ohio, division of the Niles-Bement-Pond Company. The machine has a capacity of 18 feet between the housings.

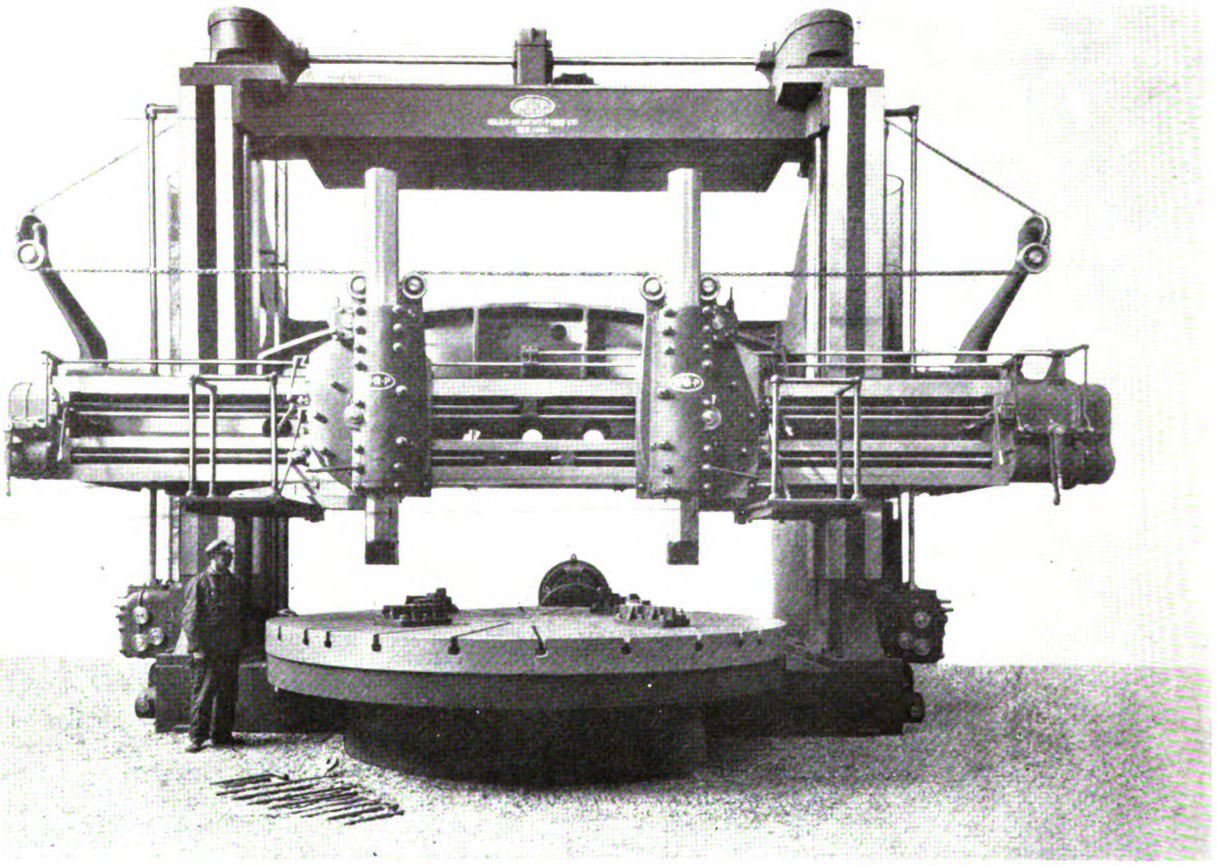
The table is supported on the bed on double annular tracks, one as near as possible to the table drive gear, the other closer to the table spindle so that the load and bearing pressures are more evenly distributed over the full area of the table. The table tracks and spindle have pressure lubrication, the oil being forced to the bearings by an oil pump driven by a separate motor. The overflow of oil is collected in a pan beneath the table and returned to the main reservoir in the foundation. The drive to the table is through a totally enclosed gear box in which all the gears dip in oil and the shafts and bearings are generously supplied from the same source.

The square box type crossrail is of an entirely new design. The section between the housings is uniform throughout its length. The clamping surface is not only against the face of the housings but extends back considerably between the housings, making for more rigid construction. A stiffener or camber beam of deep section is attached to the crossrail and corrects any deflection in this member. In addition to the top brace, the upper structure is further strengthened by a large built-up girder.

Elimination of considerable of the topworks has been effected by providing separate motors, one on each end of the rail, for the rapid traverse of the saddles and bars. The only mechanism on the top brace is the motor and driving gear for elevating and lowering the crossrail. The feeds are obtained through gear boxes with sliding gears running in oil and are independent and reversible for each head. The feeds and traverses of the bars and saddles are engaged or disengaged by means of large friction clutches on the ends of the rail. The right hand head is equipped with a special gearing arrangement whereby the saddle and bar feed may be engaged simultaneously for cutting certain tapers from the horizontal. Change gears are provided so that the tapers can be varied. The bars and saddles have direct reading micrometer dials which are graduated in inches and thousandths of an inch and show at a glance the amount of movement these members have made in relation to the reading when the feed or traverse was first engaged.

A feature of interest is an adjustable limit switch at the top of the housings which automatically shuts off the motor when the crossrail has reached the limit of its travel.

The safety and convenience of the operator has been taken into consideration by the duplication of operating levers at the saddles and ends of the rail and by providing an adjustable platform with the rail on each saddle and at the back and each end of the crossrail as well as around the top brace, with access to those parts by means of steel ladders. Counterweights are enclosed in guards of steel wire mesh.



**Niles-Bement-Pond vertical boring mill**

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THE BUREAU OF NAVIGATION, Department of Commerce, reports 163 steam, motor, sail and unrigged vessels of 40,030 gross tons built in the United States in May.

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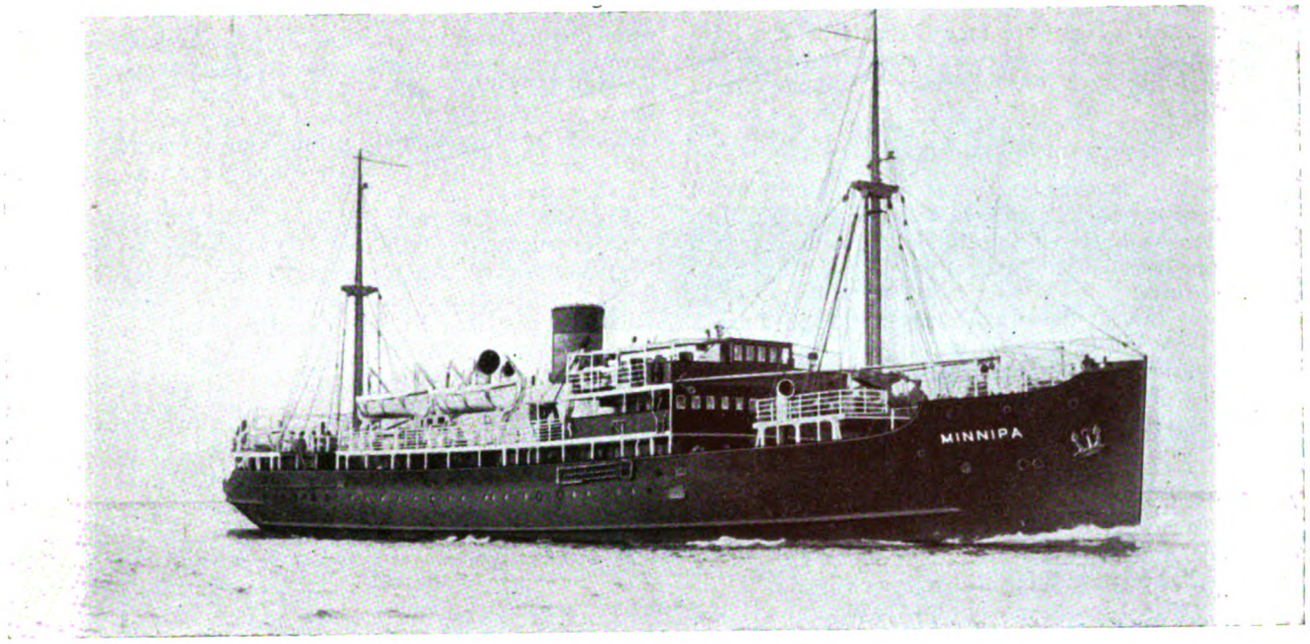



M. S. Minnipa on her trial trip

# Single Screw Motor Passenger Ship Minnipa

## Built and engined by Burmeister and Wain, Ltd. to the order of the Adelaide Steamship Company, Ltd.

THE single screw motor passenger ship *Minnipa*, built and engined by Burmeister and Wain, Ltd., Copenhagen, to the order of the Adelaide Steamship Company, Ltd., for short voyages between South Australian ports, is constructed to Lloyd's highest class and complies with the Board of Trade and Australian Navigation Act requirements.

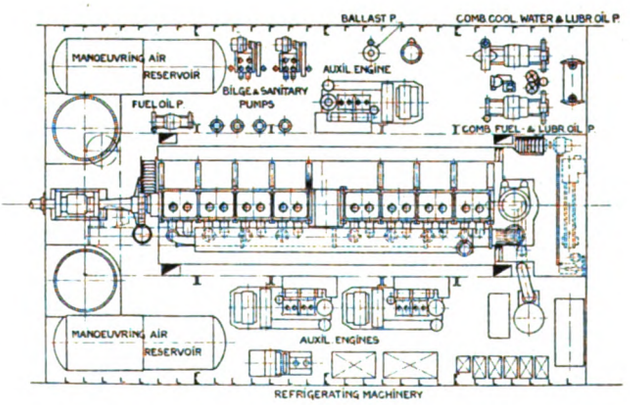
The principal dimensions are as follows:

| | |
|---|---|
| Length between perpendiculars | 252 feet 6 inches |
| Breadth molded | 39 feet 9 inches |
| Depth molded to shelter deck | 24 feet 3 inches |
| Gross tonnage | 1,976.5 |
| Net tonnage | 964.3 |
| Capacity of holds | 70,270 bales |
| Speed | 14¾ knots |
| Bunker capacity | 230 tons |

The ship has three holds, two forward and one aft of the engine room. There is one hatch for each hold, together with a trunk hatch from the boat deck on the after side of No. 2 hold. The hatch to No. 3 hold is trunked through the shelter deck. Two 3-ton steel derricks are fitted for each hatch, together with a 20-ton derrick at No. 2 hatch and two 1½-ton cranes for the trunk hatch on the boat deck. Cargo ports large enough for automobiles to pass through are fitted on each side of the main deck forward.

All deck machinery is electrically driven. The winches and cranes are of the Thomas B. Thrige make. The winches at the after hatch are arranged for warping. The windlass is of Clarke, Chapman & Company's make. The steering gear is of the electric hydraulic type of Hastie's make, placed in the after deck house on the shelter deck. An emergency dynamo is fitted in the steering gear room. Two refrigerating chambers are fitted in No. 2 hold underneath the trunk hatch, having a total capacity of about 1,900 cubic feet.

The café, situated on the shelter deck, has a seating capacity of 48 persons. As the ship is designed for night service as well as day service the sofa seats and backs can be converted into sleeping berths, thus providing sleeping accommodation for 20 persons. Similarly in the smoking room, also located on the shelter deck, the 20 table seats can be converted into sleeping berths.




Plan of engine room

The staterooms are situated on the main, shelter and boat decks. There are twenty-five 4-berth cabins and seventeen 2-berth cabins on the main deck, and four 2-berth cabins and four 4-berth cabins on the boat deck. The crew are berthed forward on the main deck and on the shelter deck in the forecastle.

The ship is electrically lighted throughout, current being supplied at 110 volts from dynamos coupled direct to an auxiliary Diesel motor. A wireless station of 1½ kilowatts



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capacity is fitted. There are four lifeboats 28 feet by 8 feet 6 inches by 3 feet 6 inches and two lifeboats 20 feet 6 inches by 7 feet by 2 feet 7 inches. The davits are of the Welin type.

### PROPELLING MACHINERY

The propelling machinery consists of one 8-cylinder, 4 cycle, single acting Diesel engine of Burmeister and Wain's standard type with forced lubrication and supercharger. The cylinders are 630 millimeters in diameter by 1,300 millimeters stroke.

Current for the auxiliary machinery is supplied by 3 dynamos of 66 kilowatts each, of Thomas B. Thrige's make, and driven by three double-cylindered auxiliary Diesel engines designed and constructed by Burmeister and Wain. The voltage for power purposes is 220 and for lighting purposes 110 volts, the current being transformed by means of a rotary transformer. Any one of the dynamos is sufficient to supply the current required for normal working when at sea.

The ballast, bilge, and sanitary pumps are all electrically driven and a pump for dealing with cargo oil is also fitted.

### TRIAL TRIP

The trial trip was run over the measured mile in the Sound of Copenhagen on May 24 and 25. The engine developed 4,278 indicated horsepower at 149.1 revolutions per minute, giving the vessel a speed of 14.94 knots

## The Contra-Rudder

IN the March issue of MARINE ENGINEERING AND SHIPPING AGE, it was announced that the Hamburg American Line had ordered contra-rudders for five vessels, which are now under construction in German yards.

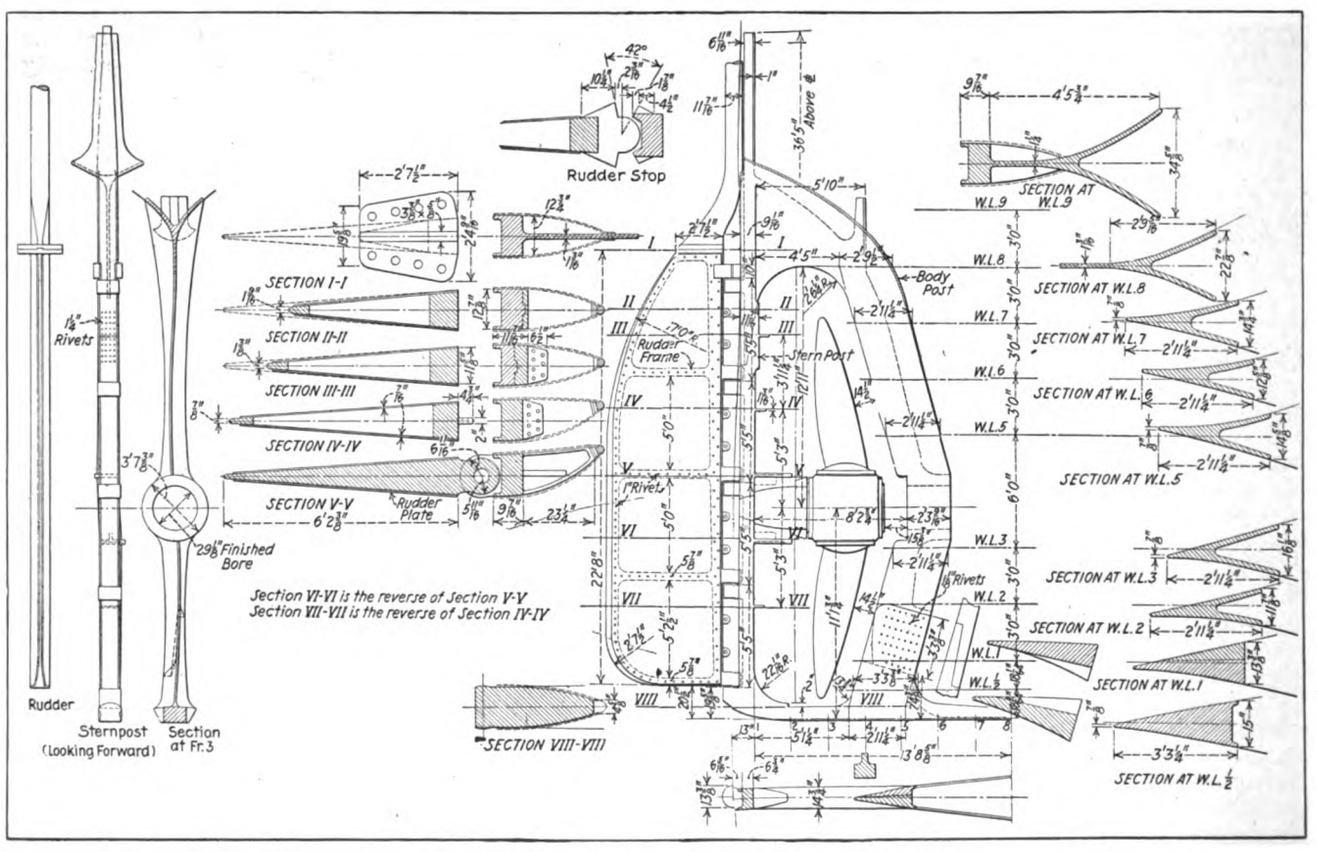
The drawing of the stern frame and rudder for these vessels reproduced on this page shows the provisions which have been made for incorporating the contrapropeller as an integral part of the ship. The body post forward of the screw propeller has been tapered off so as to prevent the formation of eddies and at the same time shaped to give the water an initial twist before it enters the screw propeller. In other words it acts as a contrapropeller type II.

The stern post abaft the wheel also differs from the usual construction. It is shaped to take the curvature of the plates which form the vertical contrapropeller blades. In addition, lugs are provided for the attachment of the centerpiece castings which are the same as used on the contrapropellers normally fitted abaft the wheel.

Another interesting feature is the construction of the rudder. This is of the built-up type, consisting of a cast steel frame covered with plating. It is of streamline shape and is made to fair nicely into the curvature of the contrapropeller, the whole forming an aero-foil shaped section. The size of the rudder stock, gudgeons and stern post are such as to form a practically continuous and unbroken surface, thus further carrying out the streamline effect.

The advantages of this design are obvious. The aerofoil section is one of minimum resistance and the disturbance caused by the ordinary blunt stern post and plate rudder are eliminated. In addition the rudder becomes a part of the contrapropeller, and augments its efficiency. Moreover, the streamline rudder steers decidedly better than the ordinary type of rudder because the water hugs the rudder more closely and there is an immediate effect from it for even a small angle of helm.

The contra-rudder, as described, has so clearly demonstrated its worth both in model basin tests and in actual service that it is now becoming the practice in many European yards either to install propelling machinery of less capacity than would ordinarily be required if this device were not fitted or to rate the vessel at a higher speed for a given engine capacity.




**Stern frame and rudder for Hamburg-American vessel**

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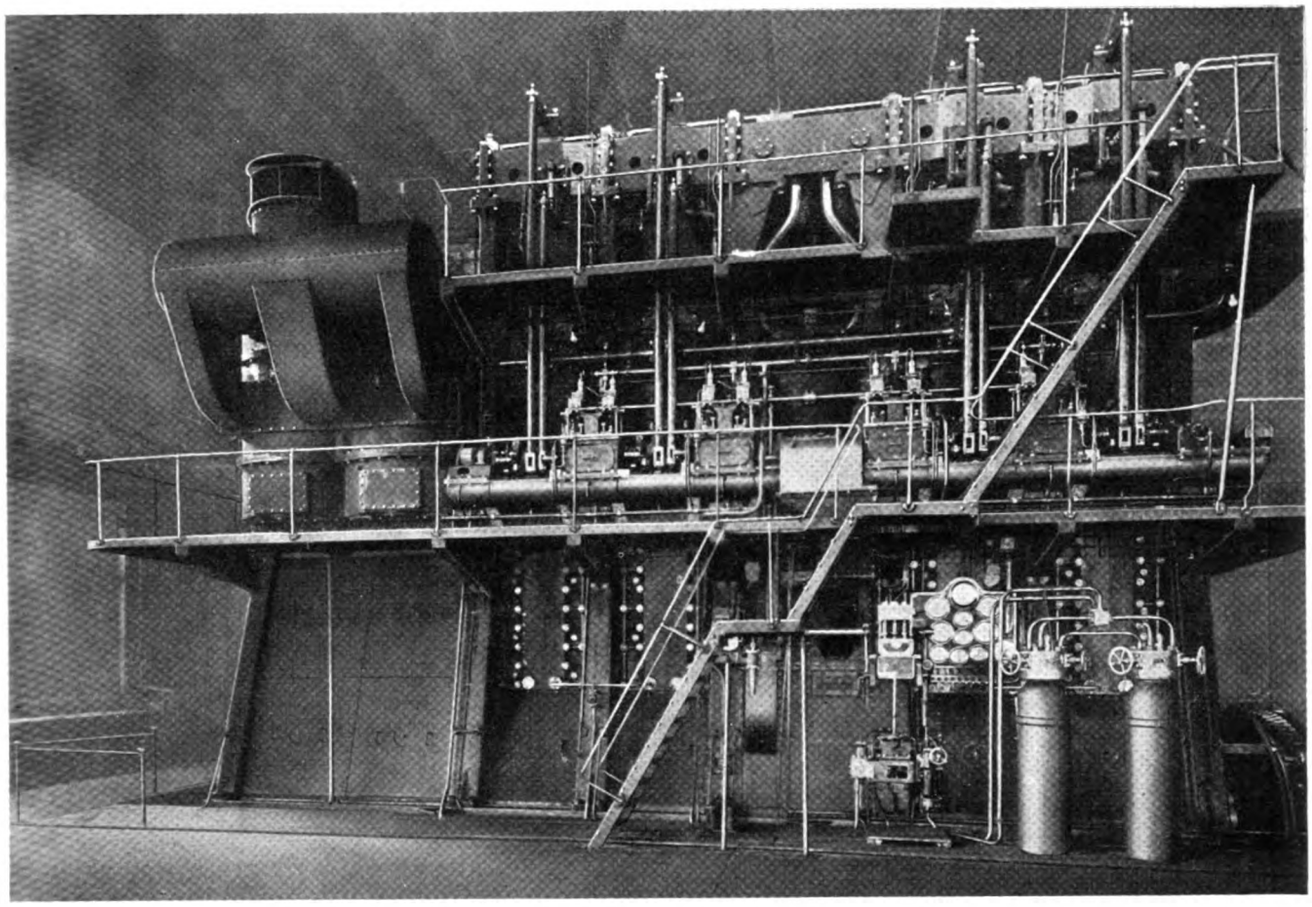
# Nelseco-M. A. N. Engine for Shipping Board Develops 3,680 Brake Horsepower on 30-Day, Non-Stop Test



**Four-cylinder, two-cycle, double-acting Nelseco—M. A. N. Diesel engine of 3,680 brake horsepower built for the Shipping Board**

WITH the advent of the double acting Diesel engine in marine circles a new and progressive step has taken place in the application of the internal combustion engine for sea going ships of all types and sizes. While many shipowners have appreciated the economies resulting from the use of the Diesel and have evidently profited as a result of this knowledge, there are others who, for various reasons, have hesitated in taking so radical a step as the change from steam to oil engine. One of these reasons for delay has undoubtedly been the belief that large, slow speed Diesels were passing through an evolutionary stage in type and design. This thought has proved correct, but progress has been relatively slow, the development of the slow speed engine of large power to its present position have occupied over a dozen years.

It is well known in shipping circles that the single acting Diesel engine has operated on the high seas for many years with great satisfaction to its owners. Competitive conditions, however, demand ships of greater earning power which in turn means more deadweight tonnage and cubic capacity, when considering hulls of similar characteristics. The attainment of additional carrying capacity necessitated a reduction in the engine room length, as well as in the total weight of the propulsive machinery. These advantages could only be obtained, to the highest degree, by the introduction and application of the double acting principle.

The engine illustrated was built by the New London Ship & Engine Company at Groton, Conn., and represents the latest development of the 2 cycle, double acting engine in this country. It develops 3,680 shaft horsepower at 115 revolutions per minute, and is of the 4 cylinder, air injection type with scavenging pump attached. Combustion takes place above and below the piston in each cylinder during every revolution, resulting in the smoothest possible flow of power through the crank shaft. It would appear that the 2 cycle, double acting type represents the final development of the internal combustion engine as it is obviously impossible to obtain a greater number of combustions from on cylinder during a revolution than in the 2 cycle type.

The engine has just completed a 30-day non-stop full load test carried on under the supervision of representatives from the United States Shipping Board, to whom the engine will be delivered. During this run, the engine developed a continuous output of 3,680 brake horsepower when operated at a speed of 115 revolutions per minute. The length of the test was selected for comparison with the longest sea run which Shipping Board vessels are called upon to make. It is interesting to note that this run, carried out without any stops whatsoever, constitutes the longest test to which an engine of this size has ever been subjected in this country.

This 3,680 shaft horsepower Nelseco 2 cycle, double-



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acting engine will be installed in the steamer *Willscox*. This ship is of 9,500 tons deadweight, 420 feet in length, 54 feet width, 33 feet 9 inches depth and was originally fitted with a 2,800 indicated horsepower steam engine. The additional horsepower will result in considerably more speed than the ship formerly developed.

A brief review of the original design and development of the first large double-acting Diesel engines will, we believe, be of interest, inasmuch as it illustrates the long and painstaking efforts devoted to the attainment of this advanced type of prime mover.

Early in 1911 the Maschinenfabrik Augsburg-Nurnberg, A. G., of Augsburg, Germany, who were the pioneers in the development of the Diesel engine and are the licensors of the New London Ship & Engine Company, undertook the design and construction of a 6 cylinder, 2 cycle double acting engine to develop 12,000 shaft horsepower. This engine was to the account of the German Admiralty for use in a light cruiser. Due to the size of the order, M. A. N. first constructed a single experimental cylinder of 2,000 horsepower, which was the basis for their design of the larger engine. After due tests and experimentation the 12,000 horsepower engine, at that time the largest Diesel engine in the world, was finally finished and successfully passed tests at the M. A. N. Nurnberg shops. The intervention of the world war delayed the development of similar units and it was not until 1920 that the M. A. N. company again took up the construction of other large 2 cycle double acting engines. Convinced that they could improve on the 1911 effort, they again built a single experimental cylinder and carried on extensive tests in the perfection of details in design and construction. The result of this effort was the placing of an order with M. A. N. from the Hamburg Electric Company for a 15,000 brake horsepower, 2 cycle, double acting engine. This engine of 9 cylinders is the largest Diesel engine in the world and is now operating in Hamburg to the entire satisfaction of its owners.

Simultaneously with this development M. A. N. began receiving large orders for marine service. Prominent among these is the motorship *Augustus*, built in Italy by Cantieri Officine Savoia. This ship is a passenger liner of the most modern type, equipped with quadruple screws, each propeller being driven by a 7,000 shaft horsepower, 2 cycle, double acting engine. Other orders received by M. A. N. during 1926 included two 5,400 horsepower, 7 cylinder, 2 cycle, double acting engines to be installed in a freighter for the Hamburg Amerika Line, also two 5 cylinder engines of the same cylinder size and developing 3,750 horsepower for single screw freighters of the same company. The North German Lloyd of Bremen have contracted for a 6 cylinder unit, developing 4,600 horsepower, which will be installed in a freight carrying vessel.

Recent orders received include two large stationary engines, each rated at 11,700 brake horsepower, both of which will be installed in the Maerk Power House, Berlin. Three smaller units, developing 2,230 horsepower each, have been contracted for in Russia and will be installed in the Stalingrad Iron Works. The Rotterdam Lloyd of Rotterdam will install in their new passenger ship, the *Kota Gede*, a 7 cylinder 5,200 brake horsepower, 2 cycle, double acting engine. The Hamburg Amerika Line have placed an order with the Bremer Vulkan Vegesach for a 17,000 ton freight and passenger ship, in which will be installed four M. A. N. double acting engines.

The motorship *Braunsfels* has recently undergone her trial trip and is now at sea. This ship is equipped with one 4,000 brake horsepower, 6 cylinder, 2 cycle, double acting engine.

The above is only a partial list of two cycle, double acting engines now under construction by the M. A. N. company and its licensors throughout the world. It illustrates, however, the enthusiastic reception which this design and type has received. Offering, as it does, marked advantages in the reduction of weight and space and also in manufacturing costs of the engine proper, this type should greatly appeal to shipowners for installation in large ocean going vessels.

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## New Alternating and Direct Current Solenoids

A NEW line of solenoids now on the market includes both alternating and direct current types and has been designed especially for uniformity and flexibility. These are made in all voltages and frequencies up to and including 550 volts, and nearly all the different types vary from each other in size only. This line is announced by the General Electric Company, and has been given the designation CR-9503.

Each size of solenoid has four types made up with the same frame. This allows any solenoid to be adapted to a variety of applications. An alternating current solenoid can be adapted for direct current operation by simply changing coils and adding a cutout switch for which all frames are drilled. A pulling solenoid may be changed to a pushing solenoid by adding two standard pusher bars. The pole face of the plunger is cylindrical and fits into a cylindrical seat on the frame. This insures quiet operation in any position.

All coils are wound on molded compound spools which eliminates the possibility of grounds. Bakelite guides prevent the plunger from wearing the spool body. The coils are held in the correct position by springs which prevent any vibration.

In the direct current type, one section of the coil is a high-resistance section which is short circuited by the cutout switch until the stroke is nearly completed. The cutout switch then opens and inserts this winding. No external resistance is necessary.

In cases where power supply is limited, the inrush amperes of the solenoid may cause the voltage to drop because of poor line regulation. Pull values are given for 85 percent voltages to take care of this condition.

Among the advantages claimed by the General Electric Company are the following:

1. Low cost.
2. Adaptability for either push or pull operation.
3. Unusually long uniform pull. (It is recommended that a lever be used with the solenoid to secure short heavy pulls. This uses the solenoid to its best advantage and permits the use of the smallest possible solenoid.)
4. Low power consumption. The entire magnetic path is laminated.
5. Great pull per pound of solenoid, resulting in space economy.
6. Compact construction.
7. Ease of mounting.
8. Quiet operation in any position. The rounded pole face insures good contact in any position.
9. No external resistance needed for the direct current type, except in a few sizes.
10. The standard solenoid can be used on the General Electric shunt-wound solenoid brakes, designated CR-9516, with but few exceptions.

In addition to the usual switch and relay operating service these solenoids have a wide field of application, including the following: tripping mechanisms, such as brakes, toggles, etc.; clutch-operating mechanisms; safety appliances, such as the safety catch on elevators; signal operation; stereopticon machines, where the solenoid

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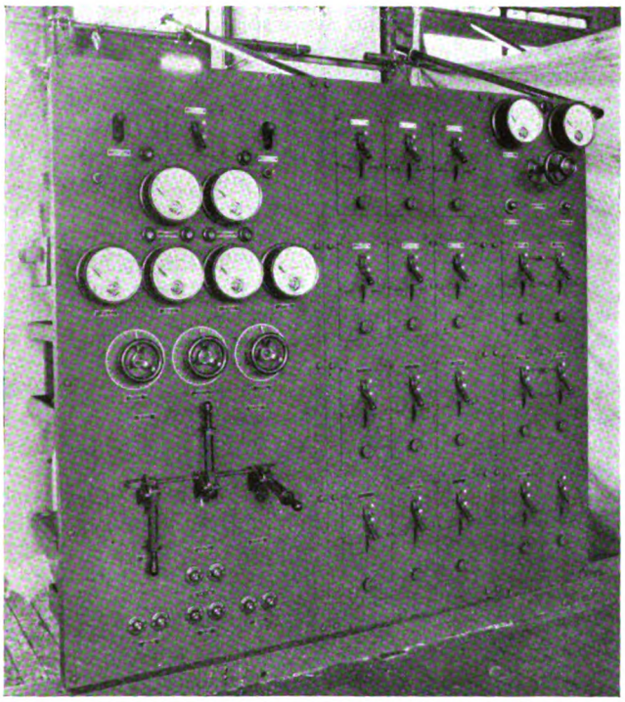
changes the slides; valves operation, such as on refrigerators, domestic oil burners, air purifiers, water softeners, whistles, etc.; bell ringing—complete chime operation can be secured from a keyboard similar to that of a piano; stamping machines; shear trips in steel mills; unloaders (on compressors), etc.

## Dead-Front Switchboards for Ocean-Going Tugs

**By G. M. Bostock***

IF there is one place more than another where the application of a dead-front switchboard is particularly ideal, that place is in a sea-going tug with electric drive. While little or nothing may be claimed in the way of space saving, much may be said of its safety features in the restricted quarters below deck when the sea is a bit rough.



Front view of switchboard

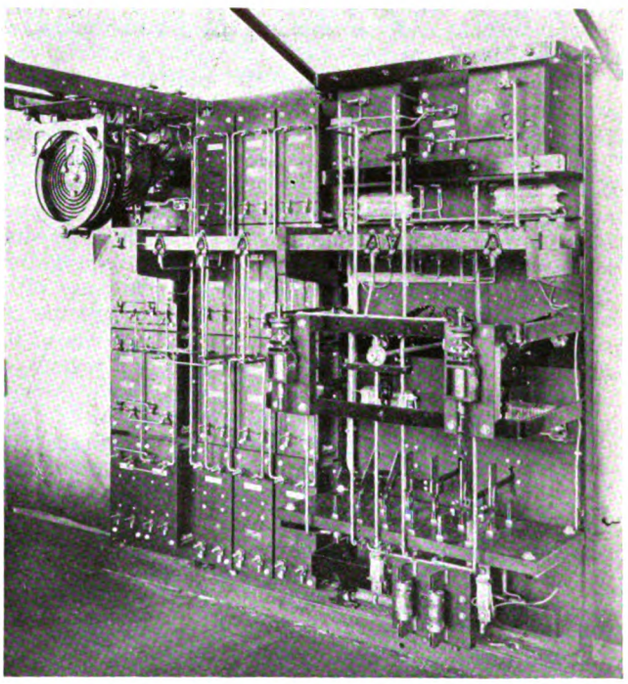
A number of boards have been installed recently for marine service and, although live-front boards were sometimes asked for, the safety feature of dead-front boards apparently won for them the preference.

Two boards, which may be cited as typical instances, were built during the past month for use in the Panama Canal Zone. The tugs, *Chagres* and *Trinidad,* in which they are to be installed, are 125 feet long, 26 feet beam and will draw about 13 feet of water. One tug is to be used at the canal entrance on the Pacific ocean end, primarily for assisting ships in distress and for general ocean towing. The other is to be used on the canal for towing dredges, steam shovels and barges and for maintenance work.

The power plant consists of two Ingersoll-Rand Diesel engines, each driving a 330-kilowatt, 250-volt generator. The main generator switches are so arranged that a fire pump may be driven from either generator. Upon each main generator shaft is mounted a 50-kilowatt, 120-volt exciter. The driving motor, rated at 750 horsepower, has a double armature and is separately ventilated. The motor may be controlled from either the right or the left side of the pilot house, or from a point 80 feet aft, in the stern of the boat.

The dead-front switchboard is to control the exciter current and the auxiliary feeders. There are two main buses: one for excitation and auxiliaries, the other for towing. Each exciter is provided with a double-throw switch so interlocked that only one exciter at a time can be on the same bus. In the exciter bus, between exciter circuits and auxiliary feeders, is an air circuit breaker of 250 amperes capacity.

The auxiliary circuits include motors for steering gear, sanitary pumps, lighting and ventilating fans, an ice machine, air compressor, circulating water pumps, fuel oil transfer and the capstan and several windlasses. Three spare switches have been furnished for emergency or temporary circuits. The lighting switch is a double-throw unit and, when the boat is at dock, the lighting circuit may be connected directly to a 120-volt source on shore.



Back view of switchboard

There are two motor-generator sets controlled from this board: one 10 kilowatts for emergency use, the other 7½ kilowatts for use in port. The smaller set is to be used when the tug is at its home-wharf. The alternating current end takes power at 220 volts, 25 cycles, from a shore source and the direct current end supplies 120-volt current to the auxiliary bus.

These switchboards were built in the regular manner, with steel panels and tops, and expanded-metal grille for the sides and back. The apparatus was assembled and shipped as a complete panel unit, ready for installation, requiring only the insertion of buses and the connecting of incoming and outgoing cables.

* Switchboard Engineering Department, General Electric Company, Schenectady, N. Y.

THE RESEARCH ENGINEERING CORPORATION, 25 Beaver Street, New York, announces the successful development of a burner for marine and general use that consumes powdered coal, oil or gas either separately or in combination. The new device, which has undergone a year's test, is the invention of D. J. Irish, formerly combustion engineer for Babcock & Wilcox Company.

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# Gasoline Cargo

By Lieut. M. E. Serat, Jr., C.C., U. S. N.

THE transportation of large quantities of gasoline in ships entails problems which have caused naval architects and ships' officers and owners a great deal of study and no little worry. The majority of these problems originate in one of two properties of gasoline:

1. Its corrosive action on iron and steel.
2. Its inflammability and the explosive nature of its vapors.

Surfaces of iron or steel exposed alternately to gasoline and air corrode very rapidly. Examination of holds used for carrying gasoline in bulk after only a few months' service shows general, progressive corrosion. An examination of a hold on the U.S.S. *Cuyama* after 6 months' use for gasoline stowage showed a uniform scale of about 1/16 inch in thickness on all structural members exposed alternately to air and gasoline. The plating and rivet heads showed the same condition. A quantity of oxide had scaled off collecting as a sludge in the bottom of the hold. This discolored and contaminated the gasoline and caused complaint by the users.

This accelerated corrosion is constantly going on wherever gasoline is thus carried and is constantly weakening the structure of the ships. All tankers are inherently limber and given to considerable distortion in a seaway. This working of the ship girder may give rise to large alternating stresses in individual members. Recent experiments have proved that alternating stresses accompanied by simultaneous corrosion greatly decrease the elastic limit and ultimate strength of a specimen in fatigue. Because of this weakening of the structure by corrosion some of the commercial carriers of gasoline have limited the service of their ships in carrying bulk cargoes of gasoline to 6 years.

It is the policy in the Navy where one hold of an oil tanker is used for carrying gasoline to periodically change the hold so used carrying the gasoline in a new space and putting the old space back in fuel oil. This prevents excessive localized corrosion. Numerous patented "gasoline proof" paints have appeared on the market from time to time, but from actual trial on naval vessels and from correspondence with many commercial carriers it would appear that none of these coatings will stand up under conditions encountered in bulk stowage on ships. The best results obtained thus far have been from using a slightly modified U. S. Navy anti-corrosive paint. The formula for this paint is given at the end of this article.

The fire hazard associated with gasoline cargoes is exaggerated by the fact that not only is the liquid itself highly inflammable but the vapor when mixed with air in the proper proportions is very explosive.

Gasoline evaporates very quickly; spread out over a flat surface, gasoline of average specific gravity would entirely vaporize in about one hour. The vapors have an extremely low flash point and hence a mixture of vapor and air presents a constant hazard, being always subject to ignition. The explosive range of gasoline and air mixtures is from 1.4 to 6.4 percent of gasoline in air by volume. The mixture developing the most power on explosion contains 2.2 percent gasoline. If escaping gasoline vapors are ignited at considerable distances from their point of origin, the flash may travel back along the vapors and ignite the original material. One gallon of gasoline at ordinary temperatures and pressures will form about 1,424 cubic feet of vapor of 2.2 percent mixture. Gasoline cargoes offering a free surface of gasoline to air, even when only small amounts of gasoline are present, give much better opportunities for disastrous explosions than do magazines of powder.

The burning point of liquid gasoline is so low that the flash of ignited vapors will fire the liquid. For this reason an explosion of gasoline vapors is nearly always accompanied by a fire. It is well to emphasize that gasoline vapor escaping from a hold or a leaky container may be ignited at a distance from the liquid and transmit the flame to the gasoline, setting it on fire.

From the above it appears that the problems of corrosion and explosion, plus fire, have a common solution, namely the exclusion of air from the space in which the gasoline is carried. The most readily apparent means of accomplishing this exclusion is to confine the gasoline in drums or cases of small capacity. In fact a great amount of gasoline is carried in just this way especially in the tropics where the ultimate disposal is made in small lots by the drum or case. Gasoline cargo even of this type, however, has great hazards always accompanying it.

The containers are filled about 95 percent full to allow for expansion. At ordinary temperatures the vapor pressure in a container is about 10 pounds per square inch for gasoline of average specific gravity. As the specific gravity decreases, the vapor pressure increases. As the temperature increases, the vapor pressure increases. Some blends of gasoline may develop a pressure as great as 20 pounds per square inch at 100 degrees F.

When one considers that a naval tanker may carry 200,000 gallons of gasoline and a commercial tanker many times this amount, the number of small containers required to hold such a cargo is seen to be enormous. Each of these containers is subjected to the vapor pressure of the gasoline and the event that some of the number may develop leaks is at least highly probable. In case of a leak the danger of explosion and fire again appears. A small fire in a drum or case stowage will increase the pressure in adjacent containers until they also develop leaks. Gasoline drums or cases should be carefully stowed in a ship in a space containing no other cargo. No steam pipes or electric leads should pass through the stowage space. Ample sprinkling systems with distant control, to keep the containers cool in case of fire in adjacent holds, should be provided, drains being installed to carry off the water. Good ventilation and circulation of air should be provided in the gasoline stowage spaces. Some sort of temperature indicator should be provided for every compartment containing gasoline or adjacent to a gasoline compartment to give warning of fire or unusual heat.

There seem to be no definite regulations of classification societies regarding the carrying of petroleum products. The Board of Supervising Inspectors, Department of Commerce, permit the carrying of 8,000 ten-gallon cases without inspection. Greater amounts must be stowed under their supervision according to their regulations.

Often the carrying of gasoline in drums or cases is inconvenient and costly. In commercial practice where gasoline is carried in large quantities from refineries to storage tanks or from one storage point to another, it is pumped directly into and out of the ships. To seal all this cargo in small containers, stow them aboard ship and unload and empty them at the destination would involve a great amount of time and cost. In the Navy, where small deliveries are made from time to time to various ships and stations, the cost of handling drums or cases and stowing to provide for periodic small deliveries is proportionately more than in commercial shipments which generally ply directly from loading to discharging point with cargo intact. For the above reasons large cargoes of gasoline are not carried in drums or cases except where delivery is to be made in these small lots for distribution.

The general commercial practice is to carry gasoline in tankers in much the same manner as fuel oil is carried, except that no gasoline is carried in holds adjacent to fire rooms unless separated therefrom by cofferdams. The gasoline is pumped into the holds at the loading port, be-

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ing led well to the bottom of the holds by the filling lines. The holds are constructed with expansion trunks and some form of check or beat valves to relieve the gas pressure. These valves are usually provided with wire screens like a safety lamp. The best practice is to make all manholes, etc., in way of gasoline stowage of bronze to avoid sparks. On reaching the discharge port the gasoline is pumped from the ship into the discharge line.

The practice in the Navy was until recently the same as outlined in the preceding paragraph, except that only one hold of a tanker was used for gasoline, the rest carrying oil.

It can be readily seen that the above type of stowage is objectionable from the point of view both of corrosion and of explosion and fire.

The alternate exposure of the bulkheads, shell, frames, stiffeners, beams, girders and longitudinals with their rivets to gasoline and air, affords almost ideal conditions for accelerated corrosion. That this corrosion takes place and that it is accelerated is not doubted by anyone with experience in gasoline cargoes. Swash plates suffer greatly. The upkeep of a ship operating under such conditions is expensive and her life is short.

When gasoline is carried in bulk as described above there is always present a free surface of the liquid and a vapor filled space above the liquid. The main deck usually forms the upper boundary of the gasoline hold, though summer tanks may sometimes be fitted for about a quarter of the beam on each side. The deck is subjected to the pressure of the gasoline when the ship is rolling which may become quite considerable at times.

It is nearly impossible to render the seams and butts of the deck plating gasoline and vapor tight in a ship as limber as a tanker. Thus there is always present the danger of fire and explosion. A hatch or manhole carelessly secured and a man smoking out of prescribed limits may mean a disastrous explosion fire and a lost ship. The danger is especially great when filling or emptying the gasoline holds.

The Navy Department through the Bureau of Construction and Repair has for sometime been endeavoring to develop a gasoline stowage, which will minimize the corrosive effect and the explosion and fire hazard. Such a stowage must provide the following requirements:

1. Large capacity
2. Minimum free surface (preferably none)
3. Continually full capacity of gasoline and salt water.
4. Easy operation.
5. Inexpensive installation.

The first type of stowage as described earlier in this article (where the gasoline was pumped in and pumped out as required) met requirements 1, 4 and 5 (if upkeep be not considered in 5). However, requirements 2 and 3 were not even approximated. These latter, embodying the control of corrosion and fire, are of vital importance. The control of corrosion is of peculiar importance to the Navy. The tankers supplying the fleet may fill a hold with gasoline and then steam around for months discharging small quantities to various ships as required. This long time exposure to gasoline and air causes very severe corrosion.

The first design intended to better conditions may be termed the high suction system. In this scheme the gasoline level is kept about 30 inches below the deck. The suction of the gasoline pump is located about 6 inches below the surface. As gasoline is pumped out, salt water is flowed in the bottom of the stowage from a connection to the fire main. An overflow on the water filling line located below the high suction prevents pumping over salt water with the gasoline. The surface of the liquid is kept at a constant level by means of a gage glass on the second deck or in a cofferdam. The holds all have centerline bulkheads, each side having its own pumps, flood line, etc. Flow meters are provided in both the gasoline discharge line and the salt water flooding line. These separate meters should read alike and provide a check on quantities delivered. The line of demarcation between gasoline and water is determined by sounding. Strips of blotting paper soaked in methyl blue, potassium chromate or fuchsian red wrapped around a sounding rod clearly indicate the line between water and gasoline. Low suctions on the pumps allow pumping out the water for taking on a new gasoline cargo.

This type of stowage meets requirements 1, 4 and 5, and 3 partially. In practice it has been found that corrosion is greatly reduced by keeping the liquid level at a constant height, and thus excluding air from contact with the metal previously exposed to gasoline. However, several disadvantages remove this system far from the ideal:

(a) Requirement 2 is not provided any better than in the old system.

(b) After some time at sea when most of the gasoline cargo has been replaced by salt water, the great increase in weight results in a lower freeboard, and, depending on the location of the gasoline hold, often an undesirable trim of the ship. The additional weight and trim considerably decrease the speed of the ship and, when she is heavily laden with oil, might even affect her safety. The maneuvering qualities of the ship are reduced also. This is of importance in naval tankers, as these vessels are continually running alongside ships of the fleet to discharge fuel, often in rather heavy weather.

The next step in development applies the principles of "hydraulic stowage" to large capacities. The "hydraulic stowage" is in effect a U-tube. Water poured in one side forces gasoline out the other side, the difference in specific gravities of gasoline and water providing considerable head

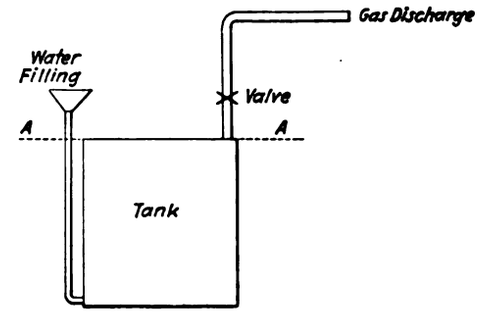


Fig. 1

on the gasoline discharge. A very simple stowage of this type is shown in Fig. 1.

Assume the tank is full of gasoline to level AA. Then, to discharge gasoline, salt water is flowed into the water filling line forcing the gasoline out at the discharge pipe, provided the discharge valve is open. The gasoline discharge being above the water inlet there is no danger of salt water carrying over. To be sure that the system is constantly full, salt water is trickled into the inlet, keeping it always overflowing. The discharge valve is kept closed except when delivering gasoline. To fill the tank with gasoline, the discharge line is connected to the supply, the gasoline displacing the water. Any expansion of gasoline merely forces salt water out of the inflow pipe.

Various forms of hydraulic stowage, all based on the above principle, are used extensively where small capacities are required as on liners, battleships, tenders, etc. Here the gasoline is carried in small tanks separate from the ship's structure. This method of carrying gasoline meets all five of the requirements previously listed. For large capacity stowages the hydraulic system presents several difficulties:

(a) It is impractical to carry large amounts of gasoline in tanks separate from the ship's structure. Generally the sides and bottom of the hull form boundaries of the holds of a tanker, decks

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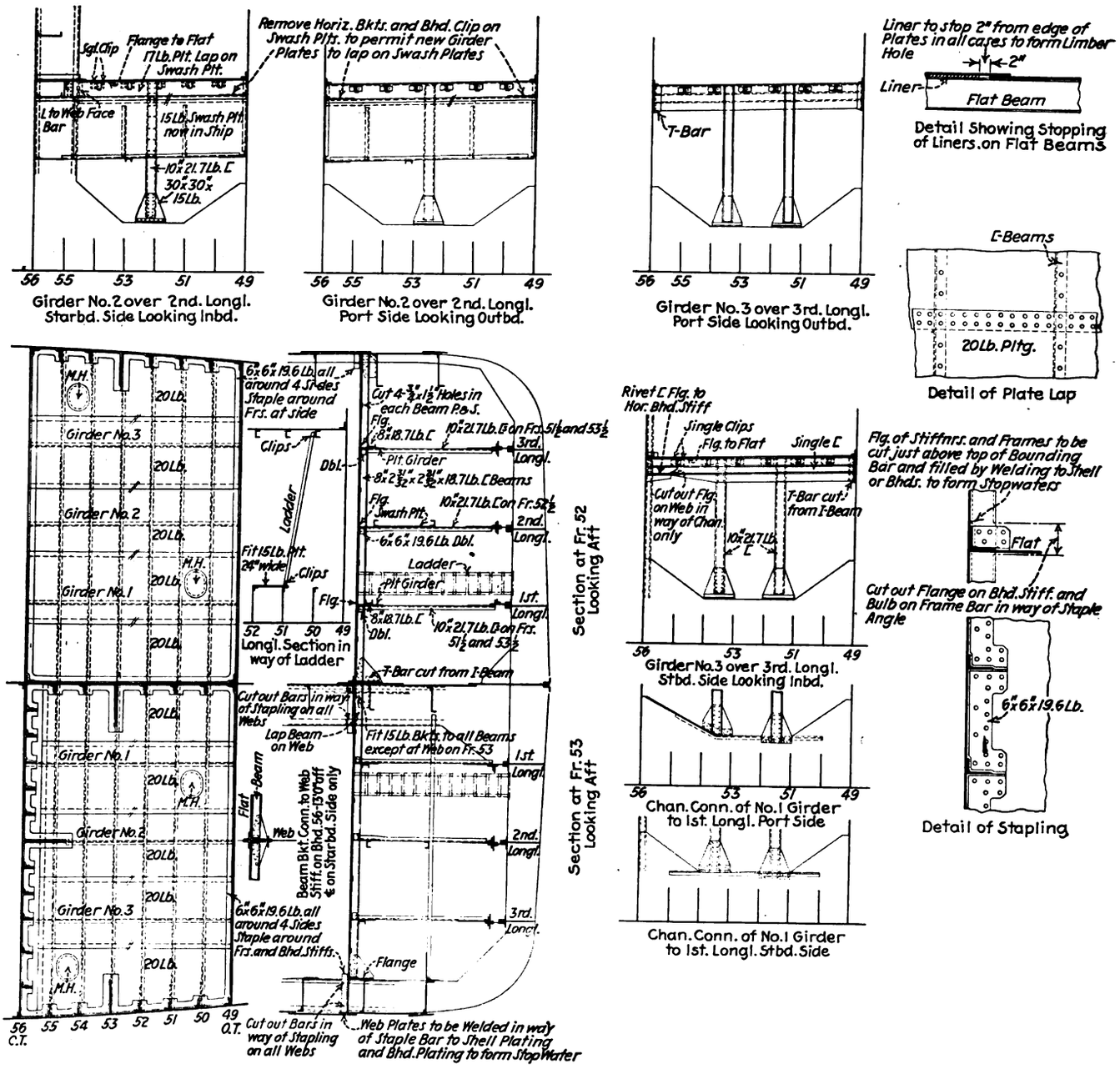
Girder No.2 over 2nd. Longl. Starbd. Side Looking Inbd.
Girder No.2 over 2nd. Longl. Port Side Looking Outbd.
Girder No.3 over 3rd. Longl. Port Side Looking Outbd.
Detail Showing Stopping of Liners on Flat Beams
Detail of Plate Lap
Detail of Stapling
Longl. Section in way of Ladder
Section at Fr. 52 Looking Aft
Section at Fr. 53 Looking Aft
Girder No.3 over 3rd. Longl. Stbd. Side Looking Inbd.
Chan. Conn. of No.1 Girder to 1st. Longl. Port Side
Chan. Conn. of No.1 Girder to 1st. Longl. Stbd. Side
Cut out Bars in way of Stapling on all Webs
Web Plates to be Welded in way of Staple Bar to Shell Plating and Bhd. Plating to form Stop Water

**Fig. 2.—Structural details of oiltight flat in hold between frames 49 and 56**

and bulkheads completing the inclosure. To confine gasoline in such a space requires very careful and costly calking and stapling. The deck forming the upper boundary is especially difficult to make tight when it is constantly subjected to the pressure from underneath which prevails in a "hydraulic stowage." If different grades of gasoline are carried in adjacent holds or if some other cargo is carried in a hold next to gasoline, the dividing bulkheads must be perfectly tight.

(b) Sounding is difficult as the holds are always under pressure. Some means of determining the gasoline content must be provided.

(c) Pressure control must be provided on the ship to prevent excess pressures in the holds when discharging or taking on gasoline.

(d) The system being always full, the ship will be at load draft at all times.

In a recent overhaul of the U.S.S. *Cuyama* at the Mare Island Navy Yard, a careful study was made of the problem of installing a hydraulic stowage. The system as finally designed and installed was especially adapted to the needs of the Navy, but the general scheme can be applied anywhere. The capacity desired for the *Cuyama* was approximately 90,000 gallons, representing normal peace-time needs.

To obtain a gasoline-tight tank top, a flat was built in the stowage hold at a height above the bottom sufficient to provide the desired capacity. The structural details of this flat are shown in Fig. 2. The flat was constructed to remain tight under a head of water extending 5 feet above the main deck. As shown in Fig. 2 the flat is strongly supported by beams and girders, the latter being tied to the main longitudinals of the ship by channels. From a strength viewpoint the construction will stand a much greater pressure than can ever be put on it in the operation of the hydraulic system, which will be discussed later. To insure tightness the flat was stapled all around with 6-inch by 6-inch by 19.6-pound angles double riveted. These heavy angles give great strength to the boundaries of the flat, and offer every advantage for tight calking. Tightness in way of frames and stiffeners was obtained by cutting the shell flanges of the bars just above the stapling and filling in by welding, extending the welding down the bar

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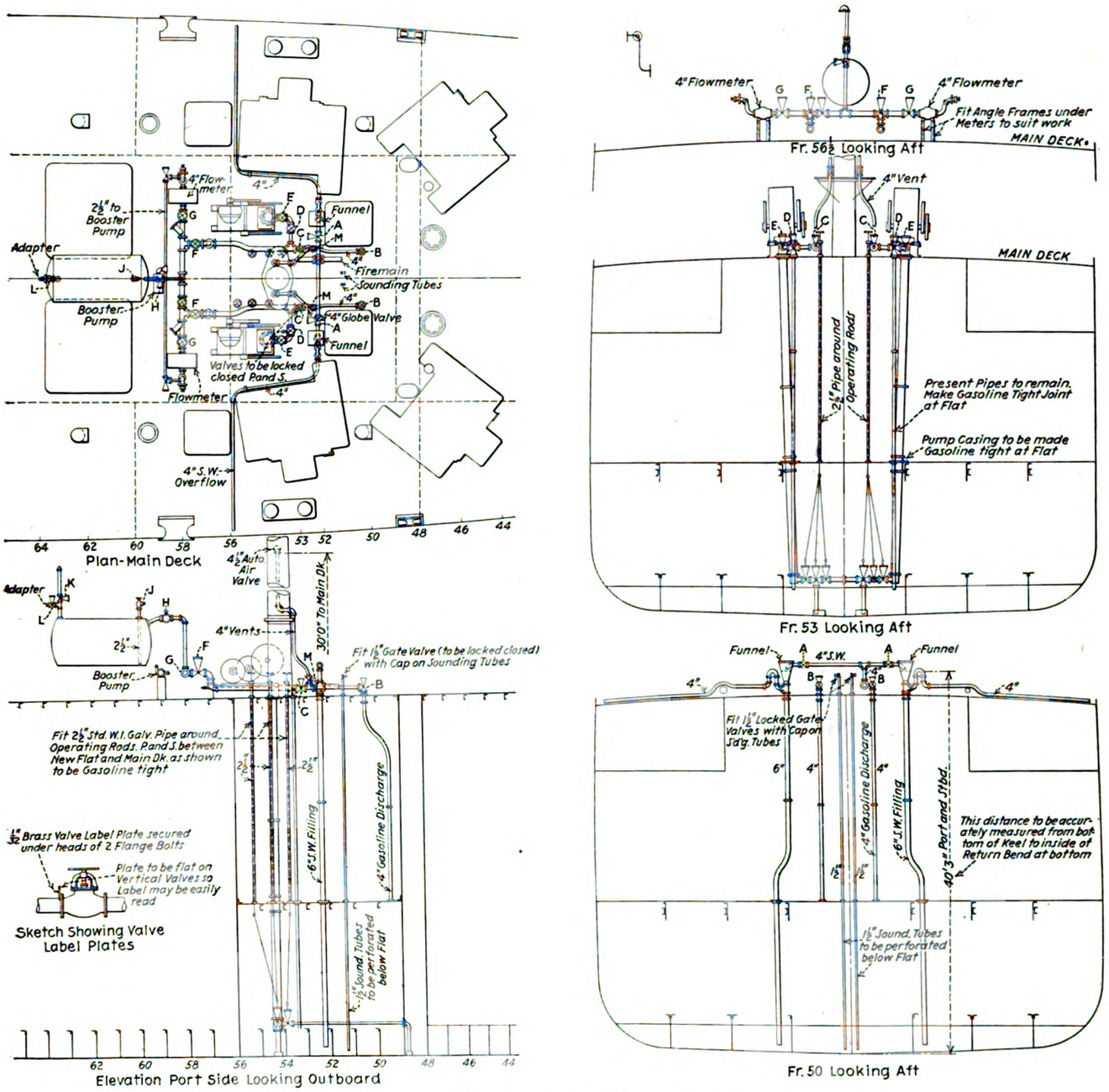
4" Flowmeter
2½" to Booster Pump
Adapter
Booster Pump
Funnel
4" Firemain
Sounding Tubes
4" Globe Valve
Valves to be locked closed P and S.
4" S.W. Overflow
Plan-Main Deck
4½" Auto Air Valve
30'0" to Main Dk.
4" Vents
Fit 1½" Gate Valve (to be locked closed) with Cap on Sounding Tubes
Fit 2½" Std. W.I. Galv. Pipe around Operating Rods, P and S. between New Flat and Main Dk. as shown to be Gasoline tight
1" Brass Valve Label Plate secured under heads of 2 Flange Bolts
Plate to be flat on Vertical Valves so Label may be easily read
Sketch Showing Valve Label Plates
6" S.W. Filling
4" Gasoline Discharge
1½" Sound. Tubes to be perforated below Flat
Elevation Port Side Looking Outboard
4" Flowmeter
Fit Angle Frames under Meters to suit work
MAIN DECK
Fr. 56½ Looking Aft
4" Vent
2½" Pipe around Operating Rods
Present Pipes to remain. Make Gasoline Tight Joint at Flat
Pump Casing to be made Gasoline tight at Flat
Fr. 53 Looking Aft
Funnel
4" S.W.
Fit 1½" Locked Gate Valves with Capon S'dg. Tubes
4" Gasoline Discharge
6" S.W. Filling
This distance to be accurately measured from bottom of Keel to inside of Return Bend at bottom
40'3" Port and Stbd.
1½" Sound. Tubes to be perforated below Flat
Fr. 50 Looking Aft

**Fig. 3.—Piping for lower gasoline tanks**

## Instructions for Operating

### General Notes

With this arrangement it is intended to have the lower tanks filled with gasoline and water to top of tanks at all times, except when a new cargo of gasoline is to be taken aboard.

When the gasoline expands salt water will be discharged through overflow pipe on main deck, when gasoline contracts salt water will have to be added through funnel in order to keep tank full.

The following instructions are for port tank, for starboard tank use valves on starboard side instead of port side. These instructions assume all valves closed before each operation except valves B, M and K, which are always open.

### To Fill Empty Fort Tank

Open salt water valve "A" port and allow water to flow into tank to a depth of 3 feet 2 inches above bottom of tank, then close this valve. Depth of water to be determined by sounding through sounding tube provided.

Attach filling hose to filling Y near meter on port side, open valves "F" and "D" port, and allow gasoline to flow into tank until salt water can be seen discharging out of overflow pipe on deck, when tank is full and valves "F" and "D" should be closed, and blank flange replaced on Y fitting.

### To Discharge Gasoline From Port Tank

Attach hose to connection on meter, open port valves "A," "C," "F" and "G" when gasoline will flow, being forced out with water from valve "A." Close all valves when desired amount of gasoline has been discharged.

Meter readings should always be taken before and after discharging gasoline, as the difference between these meter readings will give the amount of gasoline discharged.

### To Take on a New Cargo of Gasoline

After all gasoline (or as much as possible) has been discharged from tank, tank will be full (or nearly so) of salt water, which will have to be pumped down to the original 3 feet 2 inches level. Use port pump on deck to pump down water, operating valves inside tank as before this system was installed, except that water should be discharged overboard through hose attached to filling Y on deck instead of through meter. Should a layer of gasoline be left on top of water, this should be determined by sounding with a rod having a strip of blotting paper attached coated with a dye not affected by gasoline, but soluble in water. The following solutions are suggested for this purpose: (A) Methylene blue solution, (B) Water soluble fuschin, (C) Potassium chromate solution.

In pumping down to the 3 feet 2 inches water level allowance should be made for any gasoline on top of water. After water has been lowered to the 3 feet 2 inches level fill tank with gasoline as given for filling empty tank.

### Use of Gravity Tank on Main Deck

Should it become necessary to deliver gasoline to a greater height than can be done with the hydraulic system on large tanks it will be necessary to use gravity tank on main deck.

Instead of discharging through meters gasoline can be discharged into gravity tank by opening valves A, C, F and H. When tank is full (which can be determined by sounding tank) these valves should be closed.

To discharge gasoline from tank, attach fire hose with funnel on one end, to hose valve J on tank, running funnel end of hose to some place on vessel higher than gravity tank. By filling hose funnel with salt water from fire main and opening valves J and L and closing valves K, gasoline will be forced out of tank through valve L, which should have hose attached.

To drain tank of salt water open present valves on bottom of tank.

(*Continued on page* 464)

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(*Continued from page 463*)

WARNING!

Valves B and M should always be open, except when leaks occur in vent or gasoline lines, when they may be closed for repairing these leaks.

Gasoline should always be taken into tanks through valve D and never through valve B, as vent line will not vent if it is attempted to take gasoline through valve B.

Great care should be taken in filling the tanks to the 3 feet 2 inches level with water when loading a new cargo of gascline as the accuracy of the gage glasses on vents are based on this level.

USE OF BOOSTER PUMP

Instead of using gravity tank for discharging gasoline to a greater height than can be done with hydraulic system, the booster pump may be used for this purpose, running pump in conjunction with hydraulic system, connecting discharge hose to pump discharge. When using pump it will be necessary to run salt water into tanks as given for discharging gasoline.

to the stapling. This is a simple method of obtaining tightness, and has been found to be perfectly satisfactory in practice. Limber holes under the flat were cut to allow free flow of gasoline to the discharge pipes.

Fig. 3 shows the piping arrangement. The general scheme of operation is as follows (numbers and letters refer to Fig. 3):

The space below the flat is always completely filled with gasoline and salt water. Gasoline is forced out of the stowage by a static head of salt water. The water head is always kept on the tank, gasoline being restrained from flowing by valves in the discharge lines. On discharging gasoline the water inlet valve is opened to keep the water overflowing, thus insuring against loss of pressure head. Expansion of gasoline is accomplished by forcing water overboard through the inflow line. On contraction salt water is flowed into the tank to fill any void. A vent leading up the mast from the discharge line prevents the formation of a vacuum under the flat on contraction. Valves B are provided where the discharge line pierces the main deck merely for emergency use. Valves M are provided in the vents to allow the system to be used in case of damage to one of the vent lines, the latter leading off the discharge lines.

The *Cuyama* system was designed to carry a minimum of 15 percent of water. This means that the space below the flat, when full gasoline capacity is on board, is 85 percent full of gasoline. The 15 percent of water was specified to take care of all possible expansion of gasoline.

Two methods of filling are provided: The gasoline can either be forced in through the discharge line, by-passing the meters, and displace the water through the salt water filling pipe; or the water can be pumped down to the 15 percent level and the gasoline flowed in through the special pipe provided which discharges below the surface of the water. The operation using the second method is described on Fig. 3. In case the first method is used, care must be exercised to prevent excess pressure on the flat. This can be done by watching the gasoline level in the gage glasses on the vents described later. The gasoline discharge line runs higher than the salt water filling line. This prevents salt water being forced over with the gasoline.

Detail operating instructions are given on Fig. 3. With a full capacity of gasoline (tank 85 percent gasoline, 15 percent salt water) and the water running out of the overflow pipe, there will be a head of gasoline about 19 feet above the main deck. With the gasoline nearly exhausted and water running out of the overflow pipe, there will be a gasoline head of about 7 feet above the main deck. These heads vary slightly with the density of gasoline and water. The minimum head should provide steady flow under ordinary cases of fueling. However, in case a scout cruiser, airplane carrier, or other ship requiring fueling at a great height above the deck must be served, a small centrifugal pump is provided connected to the discharge lines outboard of the meters. Gasoline is forced into the pump by the hydraulic system and boosted to any desired height. The pump is driven by an inclosed, spark proof motor. The pump has no suction lift to make, and is, therefore, positive. The inlet to the pump is larger than the discharge insuring steady flow. A gravity tank is provided on deck for obtaining gasoline for the ship's own use.

In designing the system some means had to be provided for ascertaining the amount of gasoline in the stowage at any time. The sounding tubes provided could not be used when there was a head on the system, and were intended only for regulating the salt water level on pumping down. The sounding scheme finally developed is shown on Fig. 4. The maximum height of gasoline in the vent pipe running up the mast was computed using the lightest density gasoline and the greatest head of water of mean density 1.024 (tank 85 percent full of gasoline specific gravity 0.66). The minimum height was computed with the gasoline level at the flat, and greatest density gasoline (stowage empty of gasoline except for discharge pipe, specific gravity gasoline 0.76).

Gage glasses were mounted on the vent pipe as shown on Fig. 5 to give a continuous column extending below and above these extreme levels of gasoline. A number of glasses were used instead of one to facilitate repairs. A brass strip was secured along the glasses graduated into equal spaces. These spaces could be any length desired as the scale readings merely indicate heights above any chosen datum plane, which heights have to be calibrated to read gasoline volume in the tank. As actually installed the scale was divided into spaces of about 3 inches, numbered from 0 to 49; zero being the low level described above and 49 the high level. For any given scale reading (assuming water of specific gravity 1.024 running out the overflow) the volume of gasoline in the tank depends on its specific gravity. For any level of gasoline in the tank:

$$Hw \times Sw = Hg \times Sg$$

Where Hw = head of water
Sw = specific gravity of water
Hg = head of gasoline
Sg = specific gravity of gasoline

$$\text{Then } Hg = \frac{Hw \times Sw}{Sg} \qquad (1)$$

Assuming a level in the tank and Sw = 1.024.

$$Hg = \frac{Hw \times 1.024}{Sg} = \frac{\text{A constant}}{Sg}$$

This is a hyperbola.

By assuming the maximum head of water (tank 85 percent gasoline, 15 percent water) and plotting Hg against Sg in equation (1), the curve for full capacity of gasoline Fig. 4 was obtained.

Assuming the tank full of water up to the flat and plotting equation (1) again, the curve for empty stowage was obtained Fig. 4.

Equation (1) was obtained assuming Hw and Sw constant with Hg and Sg variables. Now assume Sg and Sw constant with Hg and Hw variables.

$$Hw \times Sw = Hg \times Sg$$

$$Hg = \frac{Hw \times Sw}{Sg} = Hw \times \text{A constant} \qquad (2)$$

This is a straight line.

From equation (2) we see that for any given specific gravity of gasoline the head of gasoline varies directly with the head of water. Using equation (2) it is a simple matter to draw intermediate curves between full capacity and empty stowage. If we desire "N" equal steps of gasoline level in the tank between full and empty, for any given specific gravity of gasoline the intermediate points between full and empty Fig. 4 are obtained by dividing the intercept on the specific gravity line between the full and empty curves into "N" equal parts. By dividing say 4 specific

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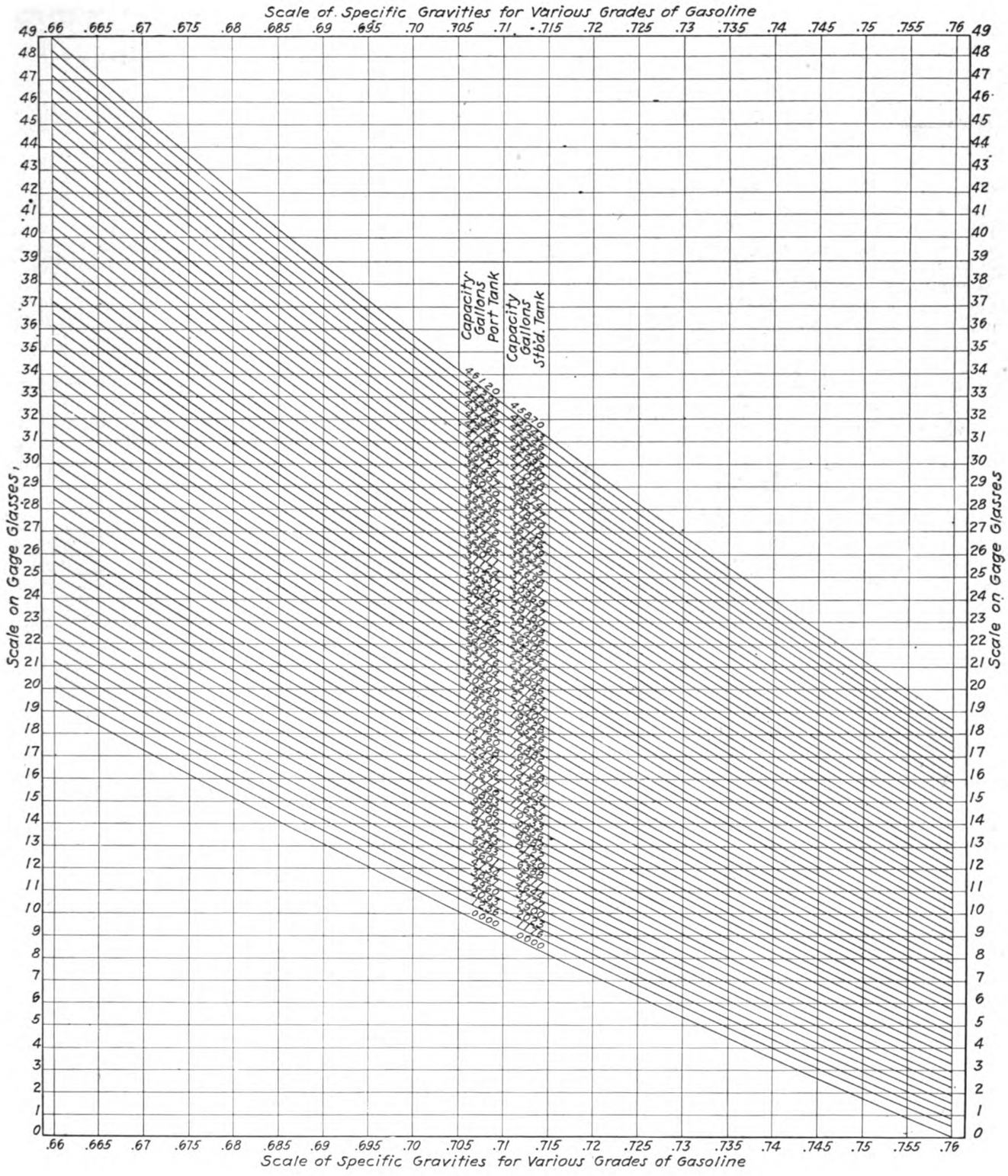
Scale of Specific Gravities for Various Grades of Gasoline
.66 .665 .67 .675 .68 .685 .69 .695 .70 .705 .71 .715 .72 .725 .73 .735 .74 .745 .75 .755 .76
Capacity Gallons Port Tank
Capacity Gallons Stbd. Tank
Scale on Gage Glasses
Scale on Gage Glasses
Scale of Specific Gravities for Various Grades of Gasoline

**Fig. 4.—Capacity curves for lower gasoline tanks**

gravity lines between the 0.66 and 0.76 limits into the desired number of spaces, control points for the intermediate curves between full and empty are obtained. Using tank capacity curves corrected for permeability, the volumes corresponding to each gasoline level in the tank were obtained. These volumes subtracted from the total capacity below the flat, gave the gasoline volumes in the tank. These volumes were entered on the curves Fig. 4.

The variation in density of sea water is too small to be taken into account in most cases. However, if correction is desired, it is easily obtained as follows:

$H'w \times S'x = H'g \times S'g$
$H'w \times S''w = H''g \times S'g$
Here $S'w = 1.024$
$H'w$ = any chosen head of water
$S'g$ = specific gravity gasoline = Constant
$H'g$ = head of gasoline corresponding to $H'w$, $S'w$
$H''g$ = head of gasoline corresponding to $H'w$, $S''w$

$$\text{Dividing } \frac{H'w \times S'w}{H'w \times S''w} = \frac{H'g \times S'g}{H''g \times S'g} \qquad (3)$$

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$$\text{Or } \frac{1.024}{S''w} = \frac{H'g}{H''g}$$

$$H'g = H''g \times \frac{1.024}{S''w}$$

Then to obtain the volume of gasoline in the stowage when the specific gravity of the water is S″w, multiply the gasoline gage reading by $\frac{1.024}{S''w}$ and enter the curves Fig. 4 with the product as the new scale reading.

To eliminate the danger of explosive vapors collecting above the flat from possible small leaks, the space above the flat was filled with $CO_2$.

It is appreciated that the installation here described is of limited application. However, there may be gasoline

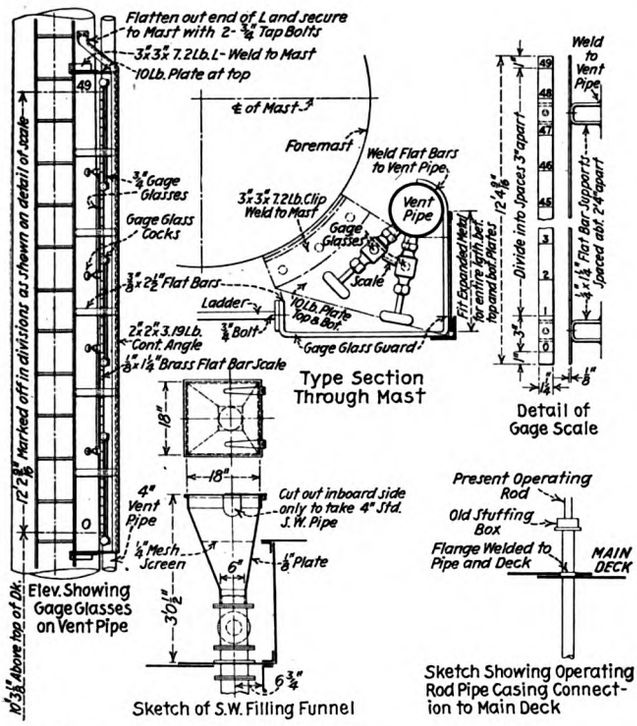

Flatten out end of L and secure to Mast with 2-⅞" Tap Bolts
3"x3"x 7.2 Lb. L- Weld to Mast
10 Lb. Plate at top
℄ of Mast
Foremast
Weld Flat Bars to Vent Pipe
Vent Pipe
Gage Glasses
Gage Glass Cocks
Ladder
Gage Glass Guard
Type Section Through Mast
Detail of Gage Scale
Present Operating Rod
Old Stuffing Box
Flange Welded to Pipe and Deck
MAIN DECK
Cut out inboard side only to take 4" Std. S.W. Pipe
4" Vent Pipe
Elev. Showing Gage Glasses on Vent Pipe
Sketch of S.W. Filling Funnel
Sketch Showing Operating Rod Pipe Casing Connection to Main Deck

**Fig. 5.—Details of gages on vent pipe on fore mast**

carriers other than the Navy whose needs are similar to those that the above scheme was designed to satisfy. Some modifications of this design might be used in commercial tankers carrying full cargoes of gasoline. It is possible in new construction to make the deck over a hold sufficiently tight to install an hydraulic system. If this is not desired, a flat could be installed at any height desired below the deck. It is believed that there may be many cases when the scheme here described for measuring volumes in a tank under pressure could be advantageously used. The *Cuyama* design provides:

1. Large capacity (any desired capacity may be obtained by properly locating the flat).
2. No free surface.
3. Constantly full stowage (no air exposure).
4. Easy operation.

The initial cost of installation may be high, but corrosion is minimized and fire hazard eliminated.

With the system here described, the stowage is always full of gasoline and water, which with the naval tankers may involve adverse trim in some conditions of loading. This, however, seems unavoidable. The hydraulic system, however, can be designed for any desired capacity and the amount of salt water replacement thus kept much smaller than in the "high suction" system.

The formula for modified anti-corrosive paint for use in gasoline tanks is:

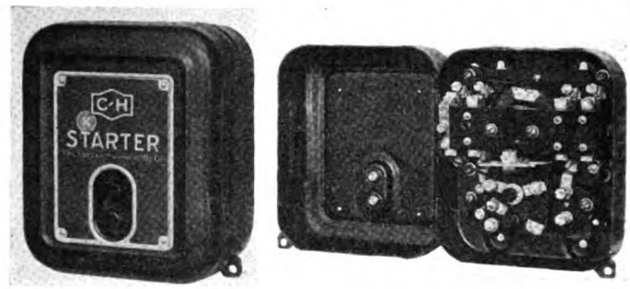
For 2 gallons:

| | |
|---|---|
| Alcohol | 12 pints 1⅔ gills |
| Gum Shellac | 2 pounds, 13 ounces |
| Red Yacca Gum | 7 ounces |
| Pine Oil | 3⅔ gills |
| Zinc Dust (dry) | 15¼ ounces |
| Zinc Oxide (dry) | 2 pounds 14¼ ounces |

## The Smallest Across-the-Line Starter

"NO larger than a telephone box," is the way the new C-H 9586 "AAA" starter is described. This new Cutler-Hammer product handles motors of 5 horsepower and under, gives push-button control of starting and stopping, provides thermal overload protection and no-voltage protection.

The starter is provided with push-buttons in the front cover of the case. The small size in most cases permits mounting of the starter where the control station would




**Cutler-Hammer push button starter**

ordinarily be placed and the extra wiring and cost of a push-button station is thus saved. However, one or more push-button stations may be used if desired.

A novel feature is the type of contactor developed for use in this starter. A roller is forced between two fingers to complete the circuit. Thus a double break, and a wiping contact, are secured. This arrangement reduces arcing to a negligible minimum.

To adapt the starter for any horsepower within rating it is only necessary to insert the proper size heater coils in the thermal overload relay.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., manufacturers of this device, also announce that the starter will be furnished to machinery builders without the case for incorporation in machinery design as standard equipment.

Sale of Four Lines Proposed.—The Shipping Board has directed the Merchant Fleet Corporation to draw tentative plans and specifications for the sale of four transatlantic cargo lines and to give the Shipping Board a report on current operating conditions of these lines. The lines are the American Scantic Line, operating from the North Atlantic to Scandinavian and Baltic ports; the America France Line, operating from the North Atlantic to French ports; the American Palmetto Line, operating from the South Atlantic to Continental European ports, and the American West African Line, operating from North Atlantic ports to the West Coast of Africa. These four lines operate thirty-six ships aggregating a total tonnage of about 294,680 tons.

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# Abstracts of Articles Translated from the Foreign Press

### Blohm & Voss

By Dr. Ing. E. Foerster

An interesting diagram appeared in this issue showing the tonnage built in the famous German shipyard of Blohm & Voss in Hamburg. This is Germany's biggest yard and perhaps the finest equipped shipbuilding plant in the world today. This yard has been in existence for 50 years. The two largest passenger liners in the world the *Leviathan* and *Majestic* were built here. Over 14,000 ships from every country in the world have docked at this yard. The number of merchant ships built is 230 with a tonnage of over one million and 200 warships amounting to about 400,000 tons. Forty-three floating docks with a carrying capacity of over 300,000 tons have been built in this yard.—*Werft-Reederei Hafen*, April 5, 1927.

### 1927 Session of L'Association Technique Maritime Et Aeronautique, May and June, 1927

The annual meeting of the French Society of Naval Architects, Marine and Aeronautical Engineers was held recently in Paris. This society is well known for its excellent scientific papers. This year's meeting had a particularly imposing program in naval architecture and marine engineering showing the great activity of the society. In these columns will appear abstracts of some of the papers as outlined below:

Geared turbine machinery in battleships. By J. H. Aubert.
Experimental studies of the resistance due to the formation of eddies. By E. G. Barrillon.
Relations between the speed, engine and propeller of a vessel. By E. Colinet.
Stabilizing of ships. By M. Dacremont.
Torsional vibrations in shafts. By M. Delaporte.
The development of the Parsons turbine. By P. Dubertret.
A note on towed objects. By M. Ficheur.
New trials with 500 horsepower tugs with propeller under hull. By V. Guilloux and E. G. Barrillon.
Contribution to the study of the influence of brick work on the radiation in furnaces of watertube boilers. Note on the employment of high pressure steam in light cruisers. By R. Therz.

### Economy of River Vessels on the Congo

This article takes up passenger and cargo craft and tug boats. The following different methods of propulsion are outlined: (1) stern wheel, (2) ordinary propeller, (3) vane wheel, (4) aerofoil propeller, (5) hydraulic propulsion.

The reasons for adoption of the stern wheel are simplicity and protection. The engines are heavy and uneconomical and the vessel's hull is severely strained. This style of drive is adopted for horsepowers from 50 to 100 at 30 to 40 revolutions per minute, with from 15 to 35 percent slip.

COMPARISON OF STERN WHEEL TUG WITH SCREW TUG

| | Propulsive Coefficient Towing | Tow pull per I. H. P., pounds |
|---|---|---|
| Stern wheel fixed vanes | 0.55 | 2.31 |
| Stern wheel movable vanes | 0.60 | 2.53 |
| Propeller free | 0.62 | 2.64 |
| Propeller protected (under hull) | 0.60 | 2.53 |

The vane wheel was invented by Sir Archibald Denny. It was first used in 1922 on a river passenger vessel for India. The vane wheel has fixed vanes and is only partly submerged. Preliminary trials on the Clyde gave 15 percent greater efficiency than the screw under the hull. Official trials are not available.

Hydraulic propulsion has been in use for many years on two river vessels 170 feet by 27 feet by 2.3 feet draft running on the Elbe in Germany. The propulsive machinery consists of two turbines drawing water in forward and ejecting it aft at great velocity. The diameter of the turbines is 43 inches, revolutions per minute 190, indicated horsepower 220, speed 6½ knots. These ships can be maneuvered easily without rudders. Unfortunately, due to the limitation of the quantity of water passing through the turbines, the efficiency of this mode of propulsion is almost 30 percent less than that of the ordinary propeller.

Diesel engines are always more economical than steam engines for regular service, and it is generally found more economical to use propellers under the hull instead of wheel.

The Diesel electric drive adopted in the United States on certain river steamers has been found too heavy and expensive for use on the Congo.—*Transactions of Association of Engineers*, Gand, Belgium. Vol. XVII, 1927. 7,500 words, 6 tables, 4 plates.

### A Note on a New Type of Quadruple Expansion Engine

This engine was constructed by d'Arnhem, Holland, for the tugboat *Teutonia III*. Quadruple expansion engines naturally are more economical when high pressures are used, but for low pressures this engine has not been widely adopted, partly because it takes up greater space and also on account of the highly complicated mechanical construction. The new engine is greatly simplified. The cranks of the high pressure and first intermediate and of the second intermediate and low pressure cylinders are placed at 180 degrees, the cranks of the two cylinder groups being at 90 degrees assuring a uniform couple and equilibrium, the pistons in the two cylinder groups moving in a contrary direction. The disposition of cylinders and slide valves is such as to give a minimum length of communication pipes, thus avoiding condensation of steam. The cylinders are arranged in line and in the order of expansion, the slide valves of the first two being arranged side by side in the same transverse plane. The low pressure slide valve is on the axis of the engine and the second intermediate pressure slide valve is on the side. There are only two valve links, one for the two slide valves in the first group, and one for the low pressure and second intermediate pressure slide valves having an intermediate rocking shaft placed longitudinally.

The length of this engine is only 7 percent more than that of a corresponding triple expansion engine of the type used for cargo ships.

The engine requires only four eccentrics, while for the triple expansion engine six eccentrics are necessary. The whole arrangement is very compact. A very remarkable economy over that of the triple expansion engine is obtained.

| | Horsepower |
|---|---|
| High pressure cylinder | 70 |
| First intermediate pressure cylinder | 69 |
| Second intermediate pressure cylinder | 81 |
| Low pressure cylinder | 78 |
| Total | 298 |

Mean pressure, 232 pounds per square inch.
Revolutions per minute, 167.
Steam per indicated horsepower per hour, 15 pounds.
Corresponding coal consumption at 13,500 B. T. U's, 1.39 pounds.

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This is considered a very satisfactory result for this type of engine working without superheating. The engine is by no means limited to small powers, but can be used with advantage for all powers. A number of detailed improvements in lubrication have been effected.—*Bulletin Technique du Bureau Veritas,* April, 1927. Two pages. Sketch.

### Single or Twin Screw?

The question of single or twin screw arrangement has particular reference to cargo steamers. It is now possible by an arrangement of gear wheels to have either one engine drive two shafts or two engines drive one shaft. The author gives tank results for the model, a normal cargo carrier of the following dimensions: Length, 448 feet; beam, 58 feet; draft, 24 feet 9 inches; displacement, 14,250 tons; Cl 0.794; midship coefficient, 0.988; V, 12 knots.

Single and twin screws were fitted on the models and experiments carried out for model ratios 1/30, 1/36, 1/42, 1/48. The experiments took place at the German national tank in Berlin. The propellers used were $B_4$ of the tank's systematic series (normal four bladed, elliptical form).

RESULTS

| V=12 knots | $\gamma$ Percent | $\gamma_p$ Percent | $\gamma_s$ Percent | $\gamma_t$ Percent | $\gamma_w$ Percent | w Percent | t Percent | $\alpha$ Percent | Percent Shaft Power |
|---|---|---|---|---|---|---|---|---|---|
| Single Screw... | 72.7 | 48.5 | 150 | 75.5 | 198.5 | 24.5 | 49.6 | 94.6 | 100 |
| Twin Screw.... | 60.1 | 53.3 | 113 | 89.1 | 126.5 | 10.9 | 21.1 | 87.8 | 121 |

These results, of course, are given in the German system of presentation of ship model experiments, this being different from the practice of the Washington tank, a full explanation of the symbols used in the table is given as follows:

$$\gamma = \frac{\text{E. H. P.}}{\text{S. H. P.}} = \text{propulsive coefficient}$$

$$\gamma_p = \frac{\text{T. H. P.}}{\text{S. H. P.}} = \text{propeller efficiency}$$

$$t = \frac{\text{thrust—ship resistance}}{\text{thrust}} = \text{thrust deduction fraction}$$

$$w = \frac{v}{V - v} = \text{wake fraction}$$

$$\gamma_t = (1 - t) = \frac{\text{ship resistance}}{\text{thrust}}$$

$$\gamma_s = \gamma_t \times \gamma_w = \frac{1 - t}{1 - w} \text{ (i. e. effect of thrust and wake on the propulsive efficiency)}$$

$$\alpha = \frac{\text{propeller efficiency with screw behind model}}{\text{propeller efficiency with screw in the open}}$$

With the propeller working in the open the velocity of water entering is of course the same over the entire disk surface. The figures given in the table are the means of several trials with the propeller revolutions corresponding to the revolutions per minute on the full sized ship. The table values of "t" and "w" are mean values. It is of interest to note the variations in these owing to the difficulty of keeping the screws in the same relative position, and also due to the influence of the continuous swinging of the water in the tank.

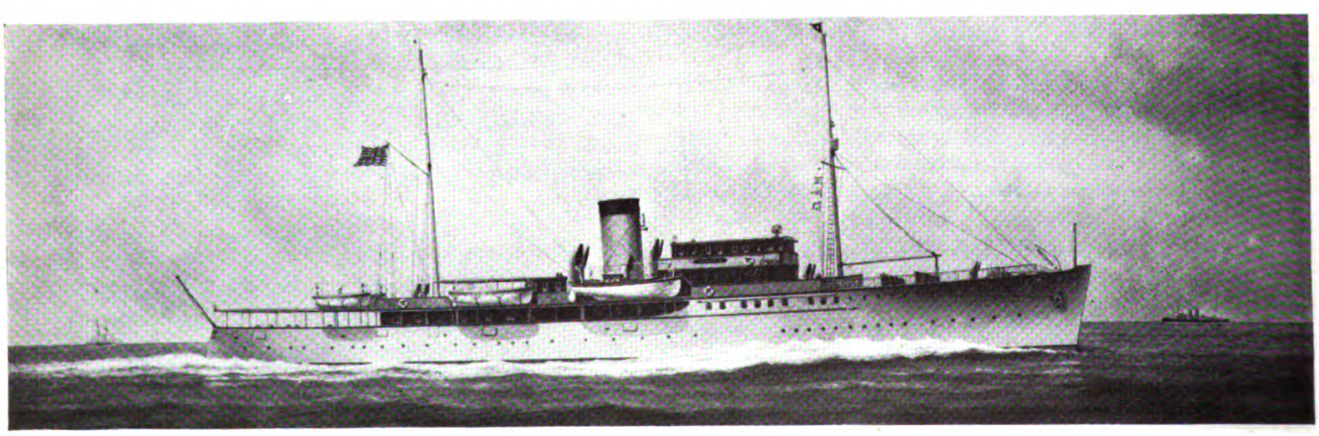
With twin screws "t" varied from 9.3 to 13.2 percent
With twin screws "w" varied from 17.8 to 24.1 percent
With single screws "t" varied from 21 to 27.2 percent
With single screws "w" varied from 47.5 to 52.5 percent

The table shows a better propeller efficiency for twin screws owing to the smaller propeller thrust in this case. The influence of the wake is clearly demonstrated by $\gamma_s$ showing a very great difference in favor of the single screw. The propulsive coefficient is much greater in the single screw vessel, the twin screw vessel requiring 21 percent greater shaft horsepower. A correction is made for wake to obtain the figures for the full sized ship (see Werft Reederei Hafen, p. 115, 1925, article by Dr. Kempf on wake correction from model to full sized ship). The correction factor in this case was 0.88 to 0.89, and the figures given in the above table after correction for the full sized ship are as follows:

| V=12 knots | $\gamma$ Percent | $\gamma_p$ Percent | $\gamma_s$ Percent | $\gamma_t$ Percent | $\gamma_w$ Percent | w Percent | t Percent | $\alpha$ Percent | Percent Shaft Power |
|---|---|---|---|---|---|---|---|---|---|
| Single Screw... | 69.5 | 51.5 | 135 | 75.5 | 178.5 | 44 | 24.5 | 94.6 | 100 |
| Twin Screw.... | 58.8 | 53.9 | 109 | 89.1 | 123 | 18.7 | 10.9 | 87.8 | 118.2 |

The models were run without a rudder. After correction for the latter the shaft power percents become, for single screw, 100 per cent; twin screw, 114.8 per cent. This shows the great resistance caused by the ordinary rudder and rudder post in single screw vessels.

Thus 15 percent indicated horsepower may be saved in this case by adopting the single screw arrangement. Of later years a good many twin screw steamers of the type in question have been built. The advantage of the twin screw in service (better submerged with light vessel, less apt to be thrown out of the water when vessel is pitching) does not materially affect the question.—*Schiffbau,* April 20, 1927. Dipl. Ing. W. Schlupp. 2,000 words. 2 tables.



**Artist's drawing of Vincent Astor's 260-foot Diesel yacht, designed by Theodore E. Ferris, New York, and now under construction at Krupp's in Germany**

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# Questions and Answers for Operating Engineers

**Practical information for marine engineers on the operation and maintenance of boilers, engines and auxiliaries**

*This department is maintained to help those who desire practical information regarding engine room problems or who are preparing to take examinations for a marine engineer's license. Readers are urged to send in questions. Inquiries bearing the name and address of the writer will be answered promptly by mail. If the question is of general interest the answer will also be published in an early issue of the magazine, although the identity of the writer will not be disclosed in doing so. Anonymous communications will not be considered.*

## Safety Valve Requirements

Q.—What requirements must a safety valve meet to function satisfactorily?

A.—It must be tight when closed. It must lift to full opening at a definite predetermined pressure without preliminary simmering.

It must remain open until the boiler pressure has dropped a definite amount. When the required pressure drop has been realized it must close tight without chattering.

## Diameter of Orifice in Viscosimeter

Q.—In the construction of a viscosimeter of the Saybolt universal type, what is the diameter of the hole or orifice through which the oil drains; also in a Saybolt-Furol type?

A.—In the "Marine Engineers' Handbook" by Sterling, edition 1920, it is stated that the opening or orifice through which the liquid is permitted to flow in the commercial viscosimeter, such as the Engler, Redwood and Saybolt Universal, is approximately 0.01 inch in diameter.

The Saybolt-Furol viscosimeter, which is specified for use in the U. S. Navy fuel oil tests, differs from the Saybolt-Universal only in size of the discharge orifice. The dimensions of this orifice are such that it requires but one-tenth as great a time approximately for a given quantity of oil of a certain specific gravity and viscosity to pass through the orifice as it does through the orifice of a Saybolt-Universal.

## Air Required for Burning Oil

Q.—In an oil burning boiler installation, what should be the amount of air supplied relative to the fuel burned? How serious is the effect of excess air supply upon the economy of the installation?

A.—Efficient boiler operation is the most important single factor in reducing the fuel consumption of a steam machinery installation. Efficient boiler operation is dependent primarily upon the reduction of excess air to a minimum. Therefore, it is apparent that admission of excess air to a boiler should be limited to the smallest practicable amount.

The complete combustion of a pound of fuel oil requires a certain supply of oxygen. The source of this oxygen is the air and the quantity of air necessary is subject to slight variation dependent upon the condition of the atmosphere.

The Bureau of Engineering, U. S. Navy Department, is authority for the statement that for average oils the amount of air theoretically required varies between 13.8 and 14.4 pounds per pound of fuel, or, expressed in cubic feet, from 180 to 200 per pound of fuel, depending upon the temperature of this and the calorific value of the fuel. All the air that enters the furnace above the amount required to completely burn the oil is excess air. It enters the furnace at fire room temperatures, generally 90 to 110 degrees F., absorbs heat, and passes out of the boiler at smoke-pipe temperatures, which may be anywhere from 500 to 800 degrees F.

In service, more air is required to insure complete combustion than is theoretically necessary. The smaller this excess can be kept while securing complete combustion the higher the efficiency. In practice at sea if excess air is kept between 50 and 20 percent the furnace efficiency may be considered good to excellent. Percentages of excess air as high as 200 are of common occurrence.

The following examples taken from the Manual of Engineering Instructions, U. S. Navy, will serve to show the effect of excess air.

Assume that 17 pounds of air enter the furnace for every pound of fuel completely consumed. The stack temperature is 630 degrees F. The fireroom temperature is 90 degrees F. The air supplied for combustion enters the furnace at fireroom temperature. The gases of combustion leave the boiler at 630 degrees F.

Seventeen pounds of air per pound of fuel oil represent about 20 to 22 percent excess air, which is a practical minimum. The heat units used out of the pound of oil burned to raise the temperature of the 17 pounds of air from 90 degrees to 630 degrees F. are a loss, but when the excess air, as in this case, is at a minimum, it is an unavoidable loss. Approximately one-fourth of a British thermal unit is absorbed by each pound of the gases of combustion per each degree of temperature rise.

The weight of the smoke-pipe gases due to the complete combustion of 1 pound of oil and 17 pounds of air is $1 + 17 = 18$ pounds.

Therefore:

$$\text{B. T. U. lost per pound of gas} = \frac{630 - 90}{4} = 135 \text{ B. T. U.}$$

B. T. U. lost per pound of oil $= 18 \times 135 = 2{,}430$.

Assuming that the oil in this case has a calorific value of 19,000 B. T. U. per pound, the percent loss due to smoke-pipe gases $= \frac{2{,}430}{19{,}000} = 12.8$ percent.

The above loss is very low and would give high boiler efficiency. On the other hand, suppose that 33 pounds of air entered the furnace for every pound of oil fuel burned; this would represent approximately 135 percent excess air, which is not uncommon.

Then weight of smoke-pipe gases per pound of fuel $= 1 + 33 = 34$ pounds.

B. T. U. lost per pound of oil $= 135 \times 34 = 4{,}590$.

$$\text{Percentage loss} = \frac{4{,}590}{19{,}000} = 24.2 \text{ percent.}$$



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# Questions and Answers Relating to Naval Architecture and Marine Engineering

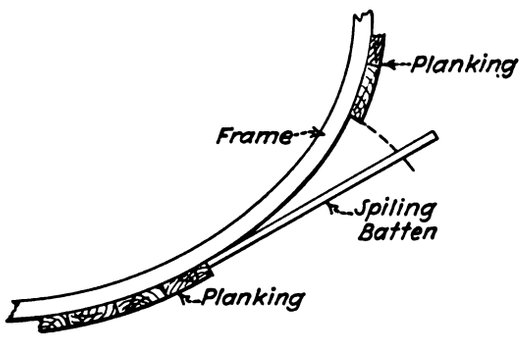
**Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer**

*This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.*

## Spiling Batten

Q.—What is a "spiling batten"?

A.—"Spiling" is a wood shipbuilding term. It is descriptive of the process of determining the curvature of a plate or plank which is to be fitted to the ship. Probably the use of a spiling batten is confined principally now to small boat construction. It is generally a piece of soft straight-grained wood about 1 inch by 1¼ inches in cross section. It is used in determining the widths of the planks at various points in their length, so as to permit their accurate cutting before being clamped in place. In the illustration a partial section of a wooden boat is shown.




**Application of spiling batten to planking of wooden vessel**

It is the practice to plank down from the sheer strake and up from the garboard. When all but three or four planks have been fitted, a spiling batten is used to measure the maximum unplanked girth. This length is then divided into the same number of equal parts as there are planks to be fitted. These lengths are marked on the batten and the batten used to measure the unplanked girths at various other frames. The widths of the planks are then reduced in proportion to the reduction in total unplanked girth.

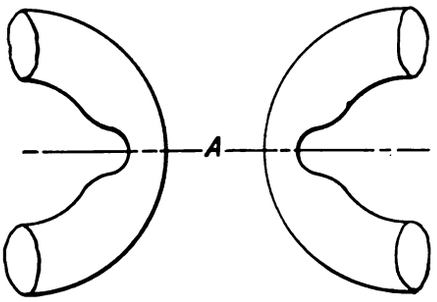
## Strength of Worn Chain

Q.—A 1-inch chain wears down to ¼-inch. What percentage of its strength remains?

A.—In the opinion of the writer, this question is not explicit, or it was stated in its present form in order to bring out a general discussion of the subject.

The greatest wear in chain links usually occurs at the ends of the link, so that two connecting links of constant cross section may, as a result of wear, assume some such form at their ends as indicated in the sketch.

The reduced section is at the point "A." It is probable that the wear has been of a sufficiently local nature so that the wire of one link closely fills the throat as worn in the other. If now it be assumed that the reduced sections are circular in cross section and the links sufficiently close fitting so as to preclude the formation of bending moments




**Sketch showing wear on chain links**

and the diameter of the reduced section be one-half the diameter of the original section, the strength of the reduced section is 25 percent that of the original section.

It should be noted that the above answer rests upon two assumptions, concerning which the question is silent; first, that the reduced sections are circular; secondly, that the wear has taken place in such a way that failure may be expected from either shear or tension—not from bending action.

## Losses Between Shaft and Effective Horsepower

Q.—A 400-foot cargo ship of usual characteristics requires 2,000 shaft horsepower on a single screw to propel it at 10½ knots. What part of this is lost in the propeller? Of the remaining part, how much is required to overcome frictional resistance and how much to overcome wave making and eddy resistance combined? Is it adequate to assume a relation between shaft and effective horsepower or is there some mode of attack based on cargo ship characteristics?

A.—It is generally sufficient to assume a ratio between the effective and the shaft horsepower and to consider that the losses between the shaft and the effective horsepower are entirely propeller losses. However, in order to harmonize the results obtained with various classes of vessels, it is customary to introduce additional modifications. The cargo vessel which you have in mind would be expected to have a block coefficient of 0.78 or 0.80. For such a hull form a very heavy wake would be expected, possibly having a value of 27 to 30 percent. There would also be a considerable thrust deduction of from 22 to 25 percent. The hull efficiency, equal to $(1 - t) \div (1 - w)$, in which "t" is the thrust deduction and "w" the wake fraction, would then have a value considerably in excess of unity so that the propeller is experiencing sufficient gain from the wake to more than offset its suction effect upon the hull.

In the case of a destroyer, for instance, of the United States Navy type, these factors practically offset one another, so that the hull efficiency is unity.

Frequently an allowance is made for the effect of the



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friction in the line and tail shaft bearings. This may run between 3 and 7 percent.

If it be assumed that the efficiency of the propeller operating in open water is 60 percent, the loss due to bearings 5 percent, and the value of the hull efficiency 108 percent, the propulsive coefficient will then be the product of these three factors or 61.5 percent.

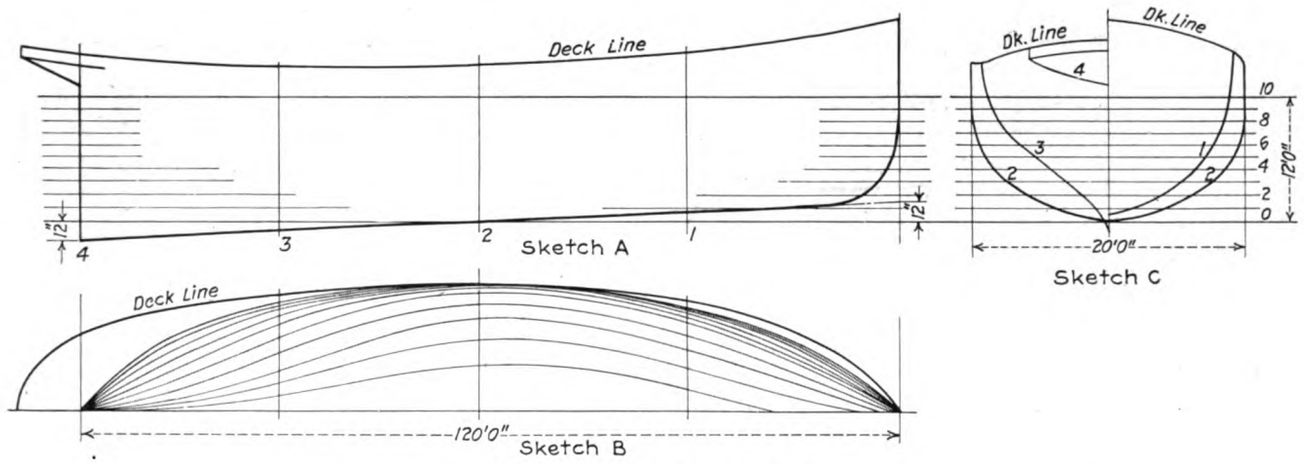
Model tests show considerable variation between the driving qualities of slow, full bodied vessels. For a reasonably good form at a speed length ratio of 0.5, about 75 percent of the effective horsepower is frictional and the remaining 25 percent is wave and eddy-making.

## Sketch of Ship's Lines

Q.—Sketch a vessel 120 feet in length, 20 feet breadth, and 12 feet draft, with a drag of 2 feet, showing 10 waterplanes. You are not allowed any measuring devices—not even a straight edge rule. Please explain how these measurements are arrived at in the sketch, and submit a sketch covering the question.

A.—It is believed that the question is intended not to test the ability of the candidate as a draftsman but to ascertain his knowledge as to the principles underlying the delineation of form and his familiarity with the meaning of the terms used and the proper placing of dimensions upon a drawing.

The sketches A, B and C show the writer's idea of the problem. It will be noted that these have been drawn without the use of scales. No attempt has been made to check the offsets or dimensions from one sketch to another. "A" is the profile showing sheer line, stem and stern contours, and keel line with drag. "B" is the plan view, showing water planes and deck line. "C" is the body plan on which are shown four sections numbered, respectively, 1, 2, 3 and 4. These have been used in approximating by eye the offsets necessary to obtain the character of the 10 water planes, which are shown on sketch "B." In preparing these sketches the ruling pen, straight edge, and curves have been used. This has been done to save time and to secure a neat appearance for publication.




Sketch showing lines of vessel

## Trial vs. Service Speed

Q.—What should be the relation between trial trip speed and the average speed to be expected at sea under service conditions?

A.—The following is quoted from comments by Professor Herbert C. Sadler in the "Transactions of the Society of Naval Architects and Marine Engineers" for the year 1919:

"It has been my experience that it is safe to say that with the same horsepower, the reduction in speed over a year for a vessel amounts to very nearly 10 percent, somewhere between 8 and 10 percent, so that if you figure on sustained sea speeds and have the trial trip result, I think you are fairly safe in saying that the speed will be reduced somewhere about 10 percent."

The answer to this question is frequently given upon a power basis, and 25 percent margin of power is given over that required to make the designed service speed. For cargo carrying vessels of the usual form and speed a 25 percent difference in power would amount to 8 percent difference in speed.

## Location of Parallel Middle Body of Lake Freighter

Q.—Where, with reference to the middle perpendicular, should the parallel middle body of a Great Lake freighter be placed?

A.—It is assumed that the cross section of the parallel mid body conforms to the usual lake practice—very small dead rise, a small bilge radius and a vertical side from water line to turn of bilge.

It is further assumed that the value of the prismatic coefficient contemplated is from 0.82 to 0.85.

For these conditions Professor E. M. Bragg, in Sterling's "Marine Engineers' Handbook," gives the following:

| Value of $\frac{V}{\sqrt{L}}$ | Percentage parallel middle body for minimum resistance |
|---|---|
| 0.5 | 32-34 |
| 0.6 | 36-38 |
| 0.7 | 36-38 |

He states, further, that "the parallel middle body should not be placed symmetrical with mid-ship section but about two-thirds of it should be placed forward of amidships and about one-third aft." Commander McEntee's experiments generally confirmed the above.

## Firing Order of 6 and 8 Cylinder Oil Engines

Q.—Why do port and starboard 6 cylinder oil engines generally have different firing orders while 8 cylinder engines have the same firing order, port and starboard—J. M.

A.—It is true that the firing order of 6 cylinder port and starboard engines have as a rule the same firing order and so is it also true for 8 cylinder engines, for to have it otherwise either the shafts would have to be made right and left,

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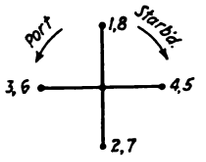
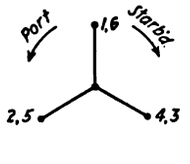
thus increasing the number of spares to be carried, or all cranks would have to be in one plane, a design which would be so bad in operation that the engine would have no good reason for existence as may be seen from Fig 5 which holds for either a two or four cycle engine.

Figs. 1 and 2 represent common practice for firing order of 8 and 6 cylinder four cycle engines respectively.



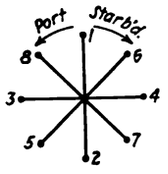

Port—1, 5, 7, 3, 8, 4, 2, 6
Stbd.—1, 6, 2, 4, 8, 3, 7, 5

Fig. 1



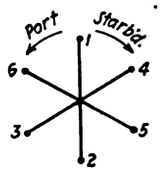

Port—1, 4, 2, 6, 3, 5
Stbd.—1, 5, 3, 6, 2, 4

Fig. 2



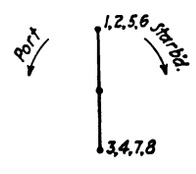

Port—1, 6, 4, 7, 2, 5, 3, 8
Stbd.—1, 8, 3, 5, 2, 7, 4, 6

Fig. 3




Port—1, 4, 5, 2, 3, 6
Stbd.—1, 6, 3, 2, 5, 4

Fig. 4




Port—1, 8, 2, 7, 3, 6, 4, 5
Stbd.—1, 8, 2, 7, 3, 6, 4, 5

Fig. 5

**Diagram showing order of firing**

Figs. 3 and 4 show the usual practice for port and starboard firing order of 8 and 6 cylinder two cycle engines respectively, while Fig. 5 is a crank arrangement for four and two cycle, 8 cylinder port and starboard engines having the same firing order.

## NEW BOOKS

SKETCHES AND WORKING OF OIL ENGINES. By Julius Kutner. Size, 10 by 13½ inches. Pages, 86. Illustrations, 164. Reprinted from *Motorship*, New York, 1926.

This book, which consists of reprints of articles originally published in *Motorship* deals with oil engine essentials. Although the designs of oil engines and the details of their mechanisms as now manufactured have been multiplied the principles underlying the various designs and their methods of working have not as yet become so numerous as to rule out the possibility of recording them adequately. It is with this idea that the present book was compiled so that students, operating engineers and designers might readily grasp the fundamentals of oil engine design and their practical application in industry. The work, although it covers a highly technical subject, has been treated in an understandable and practical manner.

THE MOTOR SHIP REFERENCE BOOK FOR 1927. Compiled by the staff of *The Motor Ship*. Size, 5¼ by 8½ inches. Pages, 192. Illustrations, 54. London, 1927: Temple Press, Ltd.

This is the third annual issue of *The Motor Ship* Reference Book. Many new features are included, and particulars are embodied of all new marine Diesel motors produced in 1926, so that every well-known type of motor ship propelling engine is described and illustrated. A feature that should prove of great value to owners, shipbuilders and engineers is the inclusion of tabulated details of all motor ships completed in 1926, as well as those on order at the present time. These lists, combined with those giving particulars of all motor ships built up to the end of 1925, thus provide the reader with information concerning every ocean-going motor ship afloat or under construction. Much has been added to the statistical sections of the book and a chapter is devoted to motor ship development in 1926, while particulars are published of 200 bunkering stations where fuel is available.

GREAT LAKES COMMERCE AND THE PORT OF OSWEGO, NEW YORK. In two volumes. Size, 6 by 9 inches. Boston, 1927: Fay, Spofford & Thorndyke.

The firm of Fay, Spofford & Thorndyke, consulting engineers, Boston, Mass., were retained by the Harbor and Dock Commission of the city of Oswego, New York, to carry through a commodity survey of present and future commerce through the Port of Oswego in connection with plans for the development of the port and harbor. This is the pioneer work of its kind undertaken in the Great Lakes region, including all contiguous territory. The survey required more than two years of scientific and exacting research with resultant data which it is felt would be of value to commercial interests of the Lakes region. The first volume contains an analysis of Great Lakes Commerce, a commodity survey, Great Lakes freight rates, a general discussion of the Great Lakes and their development, water outlets from the Great Lakes, navigable conditions on the Great Lakes and their water outlets, shipping and ship operation and a great wealth of miscellaneous information dealing with the general condition of commerce on the Lakes and their particular application to the port of Oswego. The second volume is devoted exclusively to reference maps, tables and diagrams.

AMERICAN SHIP TYPES. By A. C. Hardy. Size, 5½ by 8½ inches. Pages, 262, including index. Numerous illustrations, New York, 1927: D. Van Nostrand Company, Inc.

It is long since we have seen a book more filled with interest to shipping people than Mr. Hardy's latest work. Foreigners particularly will find their attention held by its descriptions of what must to them appear novel conditions of service and of the various types of vessels which have been evolved to meet these conditions.

The book shows evidence of careful planning and forethought and is admirably arranged, not only to present a general view of America's regional distribution of shipping, but also to enable the reader to grasp the problems peculiar to each region and to understand the reasons of the design and building of ships of such widely varying types.

One might perhaps wish that different vessels had, in some instances, been chosen as examples of general types as, for instance, the illustration of Atlantic Coast vessels by a photograph of a lake-built, canal type cargo ship, which has been converted to Diesel drive. Barring one or two instances of this sort the illustrations appear appropriate and cover most of the various classes of American mercantile vessels. A few minor errors, mainly typographical, have crept in, but in most cases are clear and of no importance. The statement that anthracite coal is shipped from Norfolk and Baltimore to northern ports, while misleading to one unfamiliar with our coastal trade, will of course be at once recognized as a not surprising mistake by those who are acquainted with conditions on the Atlantic seaboard. Such anthracite as is shipped by sea goes out of New York and Philadelphia, mainly to New England ports.

While a later edition of this book will undoubtedly show the effect of a little more complete digestion and assimilation of the contained information the present is worthy of praise, while the illustrations and typographical work are excellent.

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## LETTER TO THE EDITORS

### Inadequacy of American Laws Applying to Passenger Vessels

TO THE EDITORS:

The article "*Malolo* Collision Vindicates Safety Measures" by Mr. William Francis Gibbs appearing in the July issue of MARINE ENGINEERING AND SHIPPING AGE, is particularly interesting, not only because the safety measures adopted in the design and construction of the *Malolo* prevented the loss of this new liner, but because it again brings vividly before us the matter of the totally inadequate American laws applying to passenger vessels.

As I have stated often, in similar discussions, the moral obligation, of pre-eminent importance in passenger vessels, certainly exists to safeguard life and property at sea by the adoption of those reasonable safety measures or features which the development in the art of naval architecture and shipbuilding dictate. For this reason, the statement on page 397 by Mr. Gibbs, to the effect that with regard to statutory enactments dealing with safety of passengers at sea, he believes "our American laws are so far behind the times and the development of the art of naval architecture, as applied to passenger vessels, that they are practically obsolete," and suggesting drastic revision of these rules regulating sub-division, is something that should be brought to the attention of those responsible for these statutory enactments.

Perhaps the nation which now has the most modern regulations relating to the construction of ocean passenger vessels is Great Britain; that country has also the Board of Trade, which is charged with the enforcement of these regulations, a function which it appears to perform admirably. The provisions of the International Conference for the Safety of Life at Sea, held in London in 1914, amplified further by the lessons learned from the inquiry into the loss of the *Empress of Ireland,* have in substance been enacted into British law and form the basis of the Board of Trade requirements. We are sorely lacking in suitable and adequate regulations relating to the construction of ocean passenger vessels. What laws and regulations we have have in some very important respects become so inadequate and obsolete as to be hindrances rather than helpful. When our statutory regulations are revised and modernized, we would do well to emulate what our British friends have done and are doing in this regard. It is to be hoped that reasonable and modern regulations will soon be formulated.

Too great emphasis cannot be laid upon Mr. Gibbs' statement: "Notwithstanding that the provisions of the London Conference for Safety of Life at Sea are not mandatory in this country, there would still seem to be a moral and ethical obligation resting upon the designer and shipowner to provide and so design passenger steamers that they at least comply with the provisions of this conference and at the same time have sufficient stability to avoid a dangerous list at the time of accident."

I think Mr. Gibbs and MARINE ENGINEERING AND SHIPPING AGE should be commended for having respectively written and published this most interesting and appropriate article dealing with this unique event—unique in the sense that it is the first large vessel to have been in a serious collision, surely a major accident, while on her trials—unique also in that it represented the ultimate in present-day safety. That the vessel withstood this severe test reflects credit upon the designer, builder and owner.

CARL E. PETERSEN.

## PERSONAL MENTION

HAROLD T. FAULKNER has been made third assistant engineer on the steamship *West Chopaka,* operated by Swayne & Hoyt, Inc., San Francisco, Cal.

OSCAR MOREND, formerly chief engineer of the National Steamship Company, San Francisco, Cal., steamship *Brunswick,* has been appointed chief engineer of the steamship *Noyo,* relieving K. P. Anderson.

ARTHUR WEST resigned his position on July 1 as manager of the Power Engineering and Sales department of the Bethlehem Steel Company. He will be retained, however, as consulting engineer for the Bethlehem Company.

CLEMENT C. SMITH of Milwaukee, who recently acquired control of the Pusey and Jones Company shipyard plant, and who has been elected chairman of the board of directors, has been appointed president, to succeed William G. Coxe, who recently died.

ROBERT A. NICOL, for 11 years vice president of the Oriental Navigation Company, 17 Battery Place, New York, has been appointed president, and Philip De Ronde, founder, and for 13 years president of the company, was elected chairman of the board.

BURTON L. DELACK, assistant manager of the Schenectady works of the General Electric Company since December 1, 1926, has been appointed acting manager. Mr. Delack fills the vacancy caused by the promotion of C. E. Eveleth, elected a vice president June 1 of this year.

HOWARD J. CURTIS, formerly general passenger agent of the Hudson River Navigation Corporation, New York, has been appointed passenger traffic manager of the corporation in charge of the Albany district, which was recently segregated from the New York executive offices.

PETER DIAS, formerly a lieutenant in the United States Navy serving as senior engineer officer and chief turbine engineer of the United States Shipping Board 535-type passenger vessels, has been appointed plant engineer for the Essex County, Hall of Records, power plant, Newark, N. J.

PAUL CHANDLER, formerly district manager for the Luckenbach Steamship Company, Inc., at Seattle, Wash., has been appointed manager of the Marine Exchange of the Los Angeles Chamber of Commerce, succeeding Major Cecil A. James, who becomes assistant manager of the foreign trade department of the chamber.

E. K. BICKNELL, navigating officer, and W. J. Steffens, junior officer of the New York State Nautical Schoolship *Newport,* have resigned. Captain H. Tomb, United States Navy, retired, who assumed command of the *Newport* recently, will appoint successors to fill the vacancies. It is understood that C. D. Schutz, executive officer, may also resign his post.

J. L. CRONE has been appointed inspector general of the United States Steamboat Inspection Service at New York, succeeding the late Captain H. M. Seeley. Mr. Crone has been attached to the service for about 30 years, being stationed at New York first as assistant inspector of boilers and later as inspector of boilers. The appointment of his successor will be announced shortly.

ERNEST I. CORNBROOKS, formerly sales manager of the Newport News Shipbuilding and Dry Dock Company, Newport News, Va., has been made assistant to W. S. Newell, general manager of the shipbuilding facilities of

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the American Brown Boveri Electric Corporation, Camden, N. J. It is understood that the various activities and subsidiaries of the American Brown Boveri Corporation are now undergoing an extensive reorganization and that within a short time the former name of New York Shipbuilding Corporation may again be used to designate the shipbuilding branch of this organization.

ANGELO CONTI, who recently opened an office at 11 Broadway, New York, as a consulting naval architect and marine engineer, was graduated in 1904 from the Royal Naval School in Genoa, Italy, after a 5-year term in naval architecture and marine engineering. In 1904 and 1905 Mr. Conti was engaged as hull and engine draftsman by the John N. Robbins Dry Dock Company, Brooklyn, N. Y. During the next six years of his career he was with the engineering department of the Fore River Shipbuilding Company, Quincy, Mass., successfully holding the positions of leading engine draftsman in charge of experimental work and trial trips and finally in charge of turbine design as assistant engineer. In August, 1911, after successfully passing competitive examinations he was appointed head of the computing division, Bureau of Steam Engineering, Navy Department, Washington, D. C. From 1911 to 1917 he served as head of the computing division. Between the years 1917 and 1922 Mr. Conti was with the Emergency Fleet Corporation as assistant chief engineer, chief engineer and finally as manager of the technical department. Following this period he devoted about six months to an extensive investigation of European Diesel engineering practice. Since January, 1923, Mr. Conti has been consultant to Rear Admiral W. S. Benson, commissioner of the United States Shipping Board, and has engaged in practice as an independent naval architect and consulting engineer.

Angelo Conti

CAPTAIN CHARLES A. MCALLISTER, head of the American Bureau of Shipping, who has been abroad making a survey of shipping, returned recently on the steamship *George Washington*.

H. S. HORNER of New York has been appointed acting general agent of the Philadelphia passenger offices of the United States Lines, pending a permanent appointment. Mr. Horner succeeds D. J. Russell, who resigned.

R. D. BETTMAN of Funch, Edye and Company has been elected chairman of the Atlantic Far East Conference for a term of three years. The joint conference of the Atlantic Far East and Pacific Westbound conferences is to be held in Denver, beginning Monday, September 12.

H. C. CANTELOW, former Seattle shipping official who resigned in April of this year as vice president and Pacific Coast general manager of the Luckenbach Steamship Company, Inc., New York, has organized the shipping firm of H. C. Cantelow and Son, of San Francisco, California.

N. E. PLATT has been made assistant port engineer for the United Gulf Steamship Company, New Orleans, La. For fifteen years he held berths as chief engineer on various vessels of the Southern Pacific Company. He resigned from this employ in 1919 to accept the position of port engineer for the New England district of the Shipping Board with offices at Boston, Mass. In 1920 he was transferred to New York, where he was port engineer for the Shipping Board for three years. Mr. Platt went south in 1926 as operating manager for the Lake Transit Steamship Company at New Orleans, but resigned this position to become connected with the United Gulf Steamship Company.

J. F. LAMCKE, recently surveyor for the Shipping Board at the James River Fleet, will open an office in Norfolk this month as a consulting marine engineer and surveyor. Mr. Lamcke has filled various positions with the Shipping Board as inspector, surveyor and superintendent.

CHARLES B. YULE, who has been assistant port engineer for the United Gulf Steamship Company, New Orleans, La., has been appointed port engineer for this company, succeeding J. E. Robbins, who recently resigned. Mr. Yule served his apprenticeship in the Fore River Shipbuilding Company in 1908. He was inspector of machinery in the New York Navy Yard during the years 1918 and 1919; later he had charge of installing gyro compasses on vessels at the Bethlehem Shipbuilding Corporation plant in Squantum, Mass.; from here he entered the employ of the Oriental Navigation Company, rising to the grade of chief engineer; he then joined the United States Gulf Steamship Company as chief engineer and held this post until November, 1926, when he became assistant to Mr. Robbins, the port engineer.

## OBITUARY

CAPTAIN WILLIAM J. HUNT, who was connected with lake shipping for many years, died recently at his home, 1190 Brockway avenue, Lakewood, Ohio. He was a member of the International Shipmasters' Association. Captain Hunt was 71 years of age.

CAPTAIN PETER BARRY, veteran commander of Great Lakes vessels, and one of the founders of the Barry Steamship Line, died on June 20 at his home in Milwaukee, Wis. He and his brother, the late Captain Miles E. Barry, founded the Barry Line. Captain Peter Barry was 63 years of age.

WILLIAM B. COXE, president of the Pusey & Jones Corporation, Wilmington, Del., and vice president of the Atlantic Coast Shipbuilders Association, recently died at his home in Wilmington, Del., at the age of 58 years. Mr. Coxe graduated in 1891 from the Royal Technical College at Charlottenburg, Germany. He served his apprenticeship as a marine engineer with firms at Clydebank, Scotland, and Bremerhaven, Germany. For a number of years he held the position of foreign representative and assistant general superintendent of the William Cramp and Sons Ship and Engine Building Company, Philadelphia. For 13½ years he was president of the Harlan and Hollingsworth Corporation at Wilmington, Del., and also president of the Reading Paper Mills Company. He was a director of the Wilmington Trust Company, the Equitable Trust Company of Wilmington, Del., and also of the Keystone Mutual Fire Insurance Company. During the Spanish-American war Mr. Coxe served as a lieutenant, senior grade, in the United States Navy, while in the World War he was manager of the Delaware district of the Emergency Fleet Corporation. He was a member of the Society of Naval Architects and Marine Engineers and of the Institute of Naval Architects and Marine Engineers (England).

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# The Month's Shipping and Shipbuilding News in Brief

## Shipyard, Steamship and Port Activities and Other Notes of Interest in All Branches of the Marine Industries

### Passenger and Freight Ship Planned for Inter-Island Steam Navigation Company

INFORMATION has been received that specifications were issued the early part of July for the construction of a combined passenger and freight steamship for the Inter-Island Steam Navigation Company, a subsidiary of the Matson Navigation Company, San Francisco, California. Some months ago a plan for a passenger vessel for this company was dropped. The present proposal is for a somewhat different type of vessel and of slightly smaller dimensions.

The ship as designed has a length of 295 feet between perpendiculars, length on the waterline 310 feet 3 inches, beam about 50 feet and draft 16 feet 10 inches. The vessel will be propelled by turbine machinery and will have a speed of 15 knots.

Bids for the construction of this vessel were opened by the Matson Navigation Company in San Francisco on July 25.

### New Diesel Ferryboat to Be Built on West Coast

INFORMATION has been received that the Kitsap County Transportation Company, Seattle, Washington, expects to place a contract within 60 days for the construction of a 200-foot ferryboat with a capacity of 1,000 passengers and 90 automobiles. The vessel is to be placed in the route between Seattle and Bainbridge Island. She is to be equipped with a Washington-Estep Seattle-made engine of 800 to 1,000 horsepower. The vessel will reduce the running time between Seattle and Bainbridge Island from 45 to 25 minutes. It is expected to place the new ferryboat in service next spring.

Captain John L. Anderson, president of the Kitsap Company, also stated that arrangements are being made to acquire a new Washington-Estep Diesel engine this fall for installation in the ferryboat *Hiyu*.

### Mexican Government to Build Two Coastwise Vessels in American Shipyards

INFORMATION has been received at this office that the Mexican Government intends to purchase two 5,000-ton vessels for coastwise service. The ships will be added to the service of the National Navigation Lines, one to be used in the Gulf of Mexico and the other between Mexican Pacific ports. It is stated that the Mexican Consul General in New York has instructions to contract for the construction of the new vessels by American shipbuilding firms.

### Isthmian S.S. Company Will Build Two or Three Ships

SINCE the publication of the item on the proposed vessel for the Isthmian Steamship Company, New York, which appeared in our July issue, it has been learned that either two or three vessels are being considered. A decision has been reached, according to unofficial information, on proposed machinery, which it is understood will be high pressure steam turbine drive. The vessels will be laid down in the yards of the Federal Shipbuilding Company, Kearny, New Jersey, soon after the completion of the Southern Pacific steamship which was launched on July 29 and which is now progressing rapidly.

### Long Island Railroad May Build Diesel Electric Tugboat

IT is understood that the Long Island Railroad Company, New York, is contemplating the construction of a new Diesel-electric tugboat. So far as can be learned, the new boat will follow the same general design as the last one built for the Long Island Railroad, which had a length of 100 feet, a beam of 25 feet and a depth of 12 feet 7 inches. This boat was equipped with two 400-brake horsepower vertical single-acting Diesel engines, built by the Ingersoll-Rand Company, New York. Electrical equipment in this case was supplied by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

### New Vessel for Intercoastal Service Proposed

WORD has been received at this office that preliminary plans are under preparation for the construction of an intercoastal steamship which will be designed to utilize fuel oil on her voyage from the West Coast and pulverized coal on the return trip. It is further understood that the vessel will be propelled by high pressure turbine machinery. Additional details will be available as the work progresses. The principals in the matter are not as yet known.

### Coast Guard Asks Bids on Ten Boilers for New Cutters

SEALED proposals were received by the Treasury Department United States Coast Guard, Washington, D. C., until 2:00 P. M., July 26, 1927, and then publicly opened, for 10 boilers and equipment for Coast Guard cutters *Nos. 45, 46, 47, 48* and *49*. Further information may be obtained on application.

### I. M. M. Orders Second Ship for Intercoastal Service from Newport News Shipyard

A CONTRACT for the construction of a second ship for its Panama Pacific Line intercoastal service has been awarded by the International Mercantile Marine Company, New York, to the Newport News Shipbuilding and Drydock Company, Newport News, Va. The new vessel will be identical with the *California,* now under construction at Newport News for this service, and will have the same type of propulsion, turbo-electric drive. All her auxiliaries, as in the *California,* will be electric.

The principal dimensions of the *California* are length 600 feet; breadth 80 feet; depth 52 feet; displacement when loaded 31,000 tons. She is equipped with turbo-electric drive of 18,000 horseepower. Steam is supplied by 12 watertube boilers, fitted to burn oil.

It is expected that the new ship will be ready for delivery in the spring of 1929. The *California* will be launched about October 1, and will take her place in the New York-San Francisco service in January next, with the *Mongolia* and *Manchuria.*

With its new tonnage, the Panama Pacific Line will have the two largest ships built under the American flag. Their contract speed is to be 18 knots and they will cut two days from the present length of the voyage between New York and California ports. Each will have a capacity for 800 passengers and 8,000 tons of freight. Special attention is given in their design to refrigerated cargo and each will have 100,000 cubic feet of space suitable for the shipment of fruits and other perishable commodities.

### Pusey and Jones Building $2,000,000 Diesel Yacht

THE Pusey and Jones Company, Wilmington, Del., is constructing a $2,000,000 yacht for Mrs. Richard Cadwalader of Philadelphia, Pa.

The yacht will have a length overall 294 feet, beam 38 feet 3 inches and a draft of 16 feet. Two 1500-horsepower Bessemer engines will drive her at a speed of 16 knots. The vessel will be equipped with every modern device for safety at sea, including the Sperry Gyro compass and Gyro pilot-automatic steering equipment. The stabilizer, tests for which were conducted recently in the South Philadelphia plant of the Westinghouse Electric and Manufacturing Company, will keep the vessel on an even keel in all kinds of weather and thus prevent seasickness. The yacht was designed by the firm of Henry J. Gielow, Inc., 25 West 43rd street, New York City.



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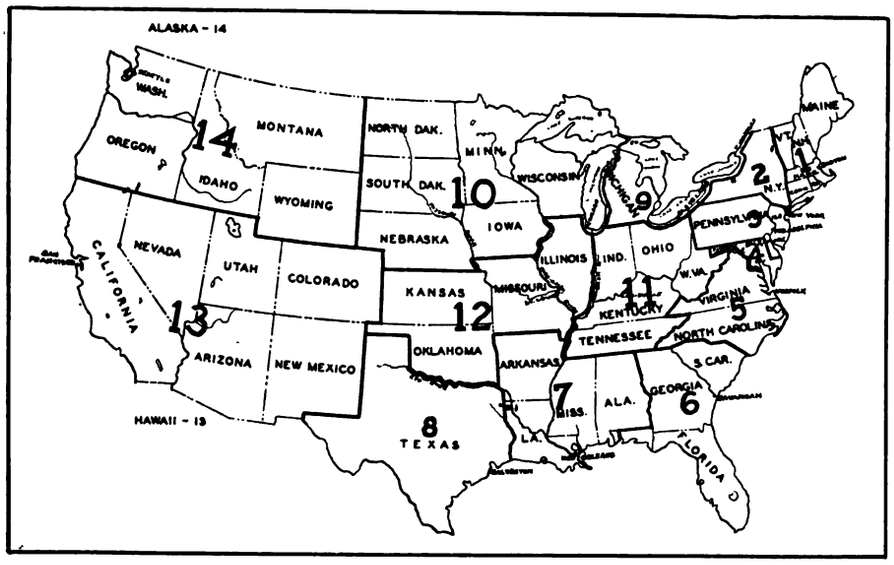


**Compensation districts and district administrative offices established under the Longshoremen's and Harbor Workers' Compensation Act**

(Map prepared by Industrial Relations Counselors, Inc., New York)

## Fourteen Districts Established for Administration of Longshoremen and Harbor Workers' Compensation Act

THE United States Employees' Compensation Commission anounced just prior to July 1, 1927, the effective date of the Federal Longeshoremen and Harbor Workers' Compensation Act, the establishment of 14 compensation districts for the administration of the act. The offices of the deputy commissioners for these districts will be located at Boston, New York, Philadelphia, Baltimore, Norfolk, Savannah, New Orleans, Galveston, Cleveland, Chicago, Louisville, St. Louis, San Francisco and Seattle.

At the time of the publication of the article, "Longshoremen and Harbor Workers' Compensation Act," by Albert S. Regula, in the June issue of MARINE ENGINEERING AND SHIPPING AGE, lack of sufficient funds made it probable that the act would be administered by only 5 deputy commissioners in as many districts. Fortunately additional funds have since been made available to the commission. There is no doubt but that the present organization will permit of more efficient administration of the act resulting in prompt adjustment of claims.

The accompanying map outlines the 14 compensation districts with their district offices. The Great Lakes are served by two districts with headquarters at Cleveland and Chicago. These districts were laid out by extending the shore line of Lake Michigan, Lake Erie and Lake Ontario and the Niagara and St. Lawrence Rivers 30 miles inland. By this action a 30-mile strip in the states of New York, Pennsylvania and Ohio is included in District No. 9 with offices at Cleveland and a 30-mile strip of the states of Indiana and Illinois in District No. 10 with offices at Chicago. In cases where navigable waters constitute state and compensation district boundaries, such waters have been included in one district without observance of state boundaries which are usually in midstream. Thus, the part of New Jersey legally included in the port of New York is in District No. 2; the Potomac River is included in District No. 4; the part of the Red River between Texas and Oklahoma, in District No. 8; the Wabash River between Indiana and Illinois, the part of the Ohio River between Kentucky and Illinois, the part of the Mississippi River between Kentucky and Missouri, and between Tennessee, Missouri and Arkansas, in District No. 11; and, the part of the Mississippi River between Illinois and Iowa, and of the Missouri River between Missouri and Nebraska, in District No. 12. The Territory of Hawaii is included in District No. 13, and the Territory of Alaska in District No. 14.

## Specifications for Converting the Willscox to Diesel Drive Issued July 23

DUE to unforseen delays, the specifications for the conversion of the Shipping Board vessel *Willscox* to Diesel drive were not issued until July 23 by Captain R. D. Gatewood's office, manager of the Maintenance and Repair Division of the United States Shipping Board, 45 Broadway, New York. The work will follow closely former conversion jobs and August 12 has been set tentatively as the date for opening bids. The M. A. N. type Diesel engine recently completed and tested by the New London Ship and Engine Company, Groton, Conn., will be installed on the *Willscox*.

## Pusey and Jones to Build New Steamer for Old Bay Line

AN order has been placed by the Baltimore Steam Packet Company (Old Bay Line), Baltimore, Md., with the Pusey and Jones Corporation, Wilmington, Del., for a new steamer to cost about $1,000,000 for operation between Baltimore and Norfolk. The vessel which will be a duplicate of the *State of Maryland* and *State of Virginia*, now operated by the same company, will be 330 feet long overall, 58 feet beam over guards and 18 feet 6 inches depth. She will be a single screw vessel driven by a triple expansion engine supplied with steam from Scotch boilers.

## Plans for Two Colliers Soon to Be Issued

IT is understood that plans and specifications being prepared by Theodore E. Ferris, naval architect, 30 Church street, New York, are nearing completion for the construction of two colliers for the Berwind-White Coal Mine Company, 1 Broadway, New York. As soon as a decision has been reached on the type of machinery to be installed for propelling these vessels and a few other details regarding special features, the specifications will be submitted to shipyards along the coast for bids covering the work. It is understood that the work will be completed within the near future so that the specifications will probably be issued early this month. At that time complete information will be available for publication.

## Specifications for Twelve Diesel Engines Issued by Shipping Board

SPECIFICATIONS for 12 Diesel engines were recently completed at the office of Captain R. D. Gatewood, manager of the Maintenance and Repair Division, United States Shipping Board, 45 Broadway, New York, and were sent out to the engine builders for bids. These engines are to be used in the second conversion program of Shipping Board vessels from steam to direct Diesel drive. No details of the new engines are as yet available, but it is understood that they will be of approximately 4,000 shaft horsepower and will operate at a higher number of revolutions per minute than the first set.

## Spanish Line Plans Extensive Building Program

THE Spanish Trans-Atlantic Line is planning to build 14 new vessels. Four of the new ships will be of 30,000 tons for service to the Far East from Liverpool with a call at a Portuguese port. Two others of the same tonnage will placed in the New York-Cadiz run. The service from Cadiz to Buenos Ayres will be increased by two ships of the same tonnage, two more vessels of 20,000 tons will be placed in the Cuban-Mexico Central America service. Others of 15,000 tons will be placed in service between North American, Spanish and South American ports.

## Newport News Company to Condition Steamship Mercer

THE United States Shipping Board has awarded a contract to the Newport News Shipbuilding and Drydock Company, Newport News, Va., for reconditioning the steamship *Mercer* at a price of $20,000 preparatory to coming to the Philadelphia Navy Yard to have pulverized coal-burning apparatus installed. After the apparatus is installed the vessel will be allocated to the America-France Line for service probably to Havre and other Channel ports from Philadelphia and New York. The line is operated by the Cosmopolitan Shipping Company and represented at Philadelphia by Charles A. Devlin, Inc.

The Lincoln Electric Company announce that the Missouri District office has been moved from 1808 Railway Exchange Building, St. Louis, to 1003 Davidson Building, Kansas City, Mr. Robert Notvest being in charge.

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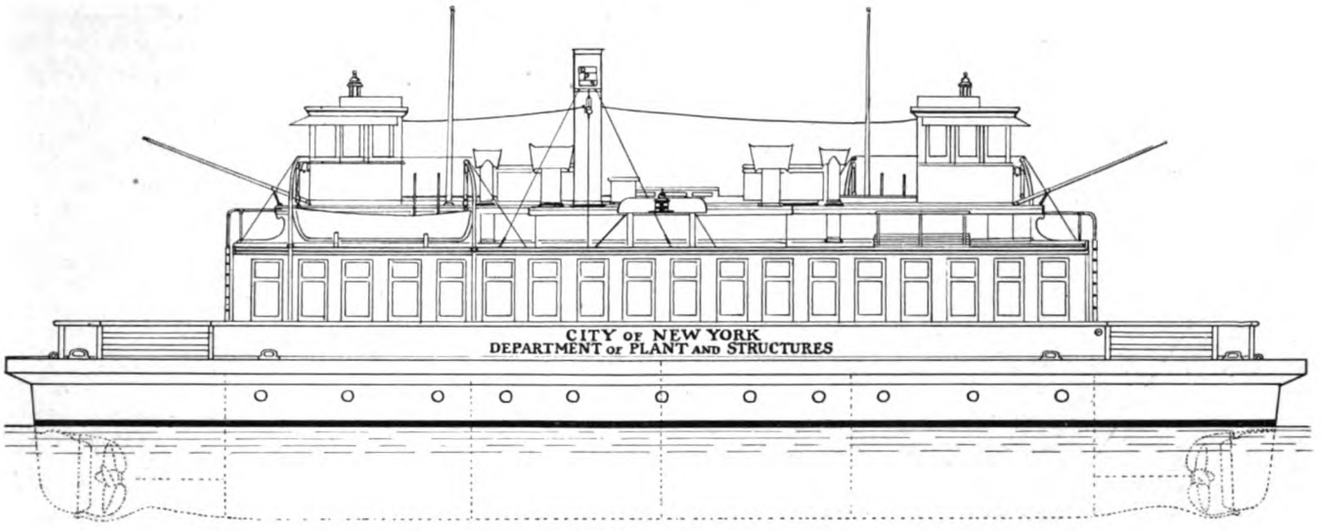



Outboard profile of first New York Diesel ferry boat

## First Diesel Ferries for New York City Launched

THE first Diesel engined ferries to be constructed by the Department of Plants and Structures of New York City were launched on July 19 at the Tebo plant of the Todd Shipyards Corp., Brooklyn. The *Greenwich Village* and the *Mott Haven* were sponsored respectively by Mrs. Alfred E. Smith, wife of the Governor, and Mrs. Joseph V. McKee, wife of the President of the Board of Aldermen.

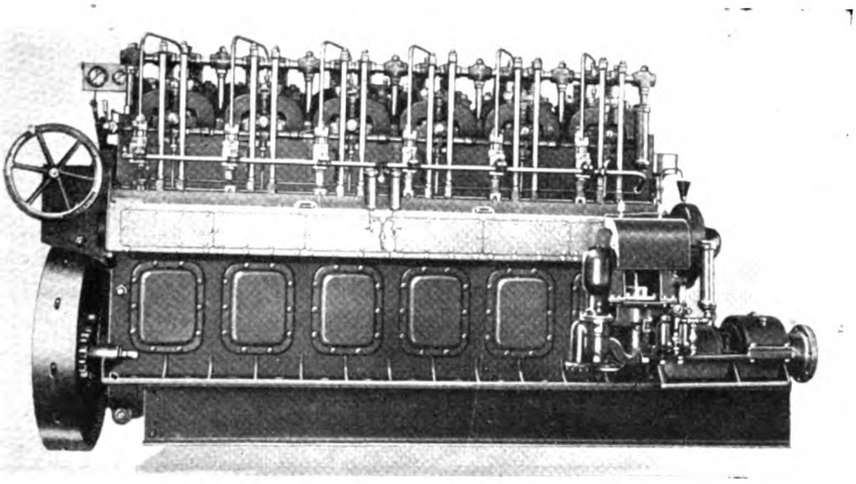
Each ferry will be equipped with one 300 shaft horsepower Nelseco Diesel engine, built by the New London Ship and Engine Company of Groton, Conn. The engines are of the 6 cylinder, 4 cycle, mechanical injection, direct reversible type and will give the boats a speed of about ten miles per hour. The engines are directly connected to the propeller shaft and are maneuvered from the engine room, as is customary with steam installations.

The vessels are of steel, 101.6 feet long with a beam of 30 feet and a depth of 12 feet and displace 234 tons. Accommodations are provided for seven vehicles and side cabins with a seating capacity of 74 persons.

One of the boats will operate between New York City and Hart's Island and the other between East 134th Street and North Brother and Riker's Islands. These terminals are now served by steamboats, but due to the better economy of Diesel machinery, these modern Nelseco Diesel ferries were selected and will give improved service to the hospitals and penal institutions, as well as effecting large reductions in operating costs.

## Bath Iron Works Sold to Maine Firm

THE Bath Iron Works, Ltd., Bath, Me., which was sold at a public auction conducted by the Industrial Plants Corporation of New York City, April 6, 1926, to C. M. Estabrook of New York at a price of $53,000, has been resold to interests identified with the Central Maine Power Company, who will immediately equip it with complete machinery for a new industry. The property was originally sold to Mr. Estabrook after an effort to dispose of it in separate parcels failed to bring bids totaling more. His bid was on the wrecking value of the property, but he held it subject to resale as a unit if a purchaser could be found.



Type 6 MIR-18, 300 to 350 brake horsepower Nelseco Diesel engine installed on new New York Diesel ferry boats

## Four Diesel Excursion Steamers Being Designed — Plans for 400-Foot Turbine Drive Yacht Also Being Prepared

INFORMATION in connection with the designing of excursion steamers by the firm of Henry J. Gielow, Inc., 25 W. 43rd street, New York, has become available. It is understood that four of these boats are under consideration and that they will each have a length of 165 feet and will be driven by twin screws. Power will be supplied in each case by two 800-horsepower Bessemer Diesel engines. The Keansburg Steamboat Company, Keansburg, New Jersey, of which W. A. Gelhaus is president, is interested in the construction of these boats for use in a new service to Coney Island which will be inaugurated next year.

The 260-foot yacht, bids for which were received recently by this firm, has not as yet been placed with any shipyard, although a decision is expected on the award within a short time.

A larger yacht, having a length of about 400 feet, is also being designed by this company and it is expected that specifications will soon be submitted to shipyards for bids. It is believed that power will be supplied by a high pressure turbine installation.

## Plant and Facilities of Wm. Cramp & Son Ship and Engine Building Company Offered for Sale

THE William Cramp and Sons Ship and Engine Building Company's plant at Philadelphia, Pa., which recently discontinued its shipbuilding operations, has been offered for sale. The Cramp Company was founded in 1830 by William Cramp and was one of the oldest shipbuilding concerns in the United States. The decision to end its shipbuilding work was due to the general curtailment of the naval construction program and the continued depression in merchant shipbuilding.

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## N. Y. State Canal Commission Awards Contract for Two Ice Breaking Tugs to Buffalo Construction Corp.

THE Buffalo Marine Construction Corporation, foot of Michigan avenue, Buffalo, New York, has been awarded a contract by T. F. Farrell, Commissioner of Canals and Waterways, Department of Public Works, Albany, New York, for the construction of two ice-breaking tugs for delivery at Lock No. 3, Waterford, New York, at a cost of approximately $100,000.

The contract calls for two steel tugs of modern construction and equipment in every detail. They are to be 77 feet in length overall, 72 feet length of keel, 20 feet 9¼ inches beam, and depth 10 feet 7 inches. The boilers will be 10 feet in diameter and 11 feet long, with 180 pounds steam capacity. The engines will be of the fore and aft compound type, cylinders 14 inches and 38 inches in diameter with 20 inches stroke. They will both be oil-burning tugs.

## Contract Placed for Construction of 50-Foot Patrol Boat

CONTRACT for the construction of a 50-foot patrol boat for the Superintendent of Lighthouses, Third District, Staten Island, New York, has been awarded to the Brooklyn Navy Yard. The vessel is to have a length forward side of stem to aft side of stern board, 50 feet; beam, to outside of plank, 10 feet; depth from top of keel to top of beam at side, 5 feet 6 inches, and camber of beam in 10 feet, 3 inches.

The boat is to be equipped with a six-cylinder, four-cycle gasoline engine, operating at 800 revolutions per minute and capable of delivering not less than 85 brake-horsepower. A double-acting force pump, having cylinder diameters of 3 inches, with a stroke of 4½ inches, is also to be installed. Bids for the work were received at Staten Island on June 7. The price involved was not given out.

## International Petroleum Co. Places Contract for Sternwheel Towboat

THE International Petroleum Company, Ltd., 56 Church street, Toronto, Ont., Canada, has awarded the contract for the construction of a sternwheel towboat to the Marietta Manufacturing Company, Point Pleasant, West Va., at a price of $234,770. The vessel is to be delivered at New Orleans about December 1, dismantled, boarded and ready for towing to Colombia. It will be of the typical Mississippi river sternwheel type, having a length of about 200 feet and will be equipped with reciprocating propelling machinery.

## Specifications Being Drawn for 250-Foot Steam Yacht

THEODORE D. WELLS, naval architect, now located at 33 Rector street, New York, is preparing plans and specifications for a 250-foot yacht. A model for the vessel is now under construction. It is understood that the yacht will be equipped with steam turbines. No further details are available at this time for publication.

## Shipping Board Authorizes Pulverized Coal Burning Equipment on the Steamship Mercer

ON recommendation of the Merchant Fleet Corporation, the United States Shipping Board has authorized the installation of apparatus to permit the use of pulverized coal as fuel on the steamship *Mercer*. This action followed a series of tests which indicated that considerable economies in operation of coal-burning vessels can be effected from the use of this method of combustion.

The vessel, which is of 9,730 deadweight tons, is at present laid up at Norfolk. Some repairs will be made to the ship, after which it will proceed to the Philadelphia Navy Yard for the installation of the pulverized coal equipment.

The *Mercer*, which was built by the Federal Shipbuilding Company, Kearny, New Jersey, in 1919, for the Shipping Board, has a length of 395.5 feet, a breadth of 55 feet and a depth of 31.4 feet. Steam is supplied by three Scotch marine boilers at a working pressure of 210 pounds per square inch. Combined heating surface of the boilers is 8,934 square feet. The vessel is driven by General Electric Company steam turbines of 2,500 shaft horsepower.

Plans for the contemplated changes in this ship and a second one which it is expected will soon be authorized, are now under consideration. The work will involve considerable rearrangement in the boiler room and adjacent spaces to provide for the pulverizer equipment, blower equipment, equipment for ventilation, changes in the bunker facilities and the like. It is understood that pulverized coal burners of the Peabody Engineering Company, New York, will be utilized. These burners have worked out successfully in tests carried out in Scotch boilers at Long Island City, New York, and more recently at the League Island Navy Yard, Philadelphia, Pa. No announcement has as yet been made as to the type of pulverizer equipment to be installed.

## Gibbs Bros., Inc. to Prepare Plans for Converting Shipping Board Vessels for Diesel Electric Drive

AUTHORITY has been granted to Commissioner William S. Benson by the Shipping Board to employ Rear Admiral David W. Taylor, retired, former chief constructor of the navy, and Gibbs Brothers, Inc., of New York, jointly, to prepare plans and specifications under which bids will be sought for alteration and installation of Diesel electric equipment on one or more of three large steel cargo steamers now laid up in the Shipping Board inactive fleet.

Admiral Taylor and William Francis Gibbs, of Gibbs Brothers, have been working together on experiments relative to the possibilities of increasing the speed of ships by alteration of the hull lines. They have submitted a report in which it is stated that their investigations indicate that certain changes in the design of the vessels considered will increase their speed. The ships under consideration are the *Courageous, Defiance* and *Triumph*, each of which is 11,773 tons deadweight.

## Power Specialty Co. and Wheeler Condenser Co. Combine to Form Foster Wheeler Corp.

ANNOUNCEMENT has been made covering the formation of the Foster Wheeler Corporation, New York, which is a consolidation of the Power Specialty Company and the Wheeler Condenser and Engineering Company. The assets, plants, engineering, research, sales departments and subsidiaries of both companies will now be assembled under the name of the Foster Wheeler Corporation.

The most widely known products of these companies are superheaters, economizers, water cooled furnaces, air heaters, tube stills, unit coal pulverizers, condensers, pumps, cooling towers, feed water heaters, evaporators, fractionating equipment and heat exchangers. These are built at Dansville and Newburgh, New York; at Cartaret, N. J.; St. Catharines, Ontario, Canada, and at Egham, Surrey, England. The companies have branch offices throughout this country and subsidiaries in Canada and Europe.

## World's Shipbuilding Increases

WITH nearly 300,000 gross tons more of merchant vessels under construction throughout the world now than at the end of March, and with over 900,000 tons more than at the beginning of this year, a return to the pre-war volume of production may be under way, says a statement just issued by Lloyd's Register of Shipping, based on returns from all maritime countries for the quarter ended June 30 last.

The rapid rise towards the close of the war, and for several years thereafter, was followed by a severe decline in output, which continued almost without a break until September of last year, when the returns showed only 1,850,000 gross tons building. From that point there has been a gradual gain, until at the end of this June, the returns showed a total only about 320,000 tons less than the June, 1914, figures, and one of almost half a million gross tons more than were building at the end of September, 1923.

The present total is 2,840,000 gross tons, as shown in the following table prepared for Lloyd's, which gives comparisons between the last two quarters, the figures being in gross tonnage:

| | June 30, 1927 | March 31, 1927 |
|---|---|---|
| United States | 146,846 | 179,325 |
| Great Britain and Ireland | 1,390,388 | 1,216,932 |
| Other countries | 1,303,311 | 1,173,607 |
| World total | 2,840,545 | 2,569,864 |

The United States and France, are the only ones, among the leading shipbuilding countries, to show a decline from their totals of the March quarter, it is pointed out. The decline in American shipyards' work of about 33,000 tons was accompanied by one of 18,000 in France. Great Britain and Ireland, however, show a gain of about 174,000 tons; Germany, of 56,000; Holland, 38,000; and Italy almost 18,000 tons. Even Russia's shipbuilding on hand showed a light gain over the March quarter, advancing from 73,440 tons to 75,340 at the end of the June quarter.

As a result of the various changes during the last quarter, Lloyd's Register points out, there have been several shifts in the relative ranking of the various countries. Great Britain and Ireland, Germany and Italy, still stand first, second and third in

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the order enumerated; but Holland, which stood sixth at the end of the March quarter is now fourth, the United States, which was fourth, is now fifth. France, which ranked fifth at the close of March is sixth. Denmark is now seventh, having a slight lead over Russia.

Seventy-one percent of the entire world's merchant shipbuilding is now being carried out to Lloyd's classification, and 92.6 percent of all the work in Great Britain and Ireland.

NEW WORK EXCEEDS LAUNCHINGS

A feature of present conditions is the excess of new work begun on steamers and motorships during the quarter just ended, in comparison with the tonnage launchings. This is shown by Lloyd's in the following table giving in gross tons the contrast during the June 30th quarter.

| | Work Begun | Launchings |
|---|---|---|
| Great Britain and Ireland... | 436,292 | 267,241 |
| Other countries ..... | 334,883 | 294,107 |
| World total ..... | 771,175 | 561,348 |

Replacements of new work over that going forward towards completion, it will be noted, shows an excess of nearly 210,000 gross tons. The excess for Great Britain and Ireland, however, was 168,000 tons, as compared with only 40,000 tons for all the other maritime countries combined. At the end of the December quarter, however, new construction begun throughout the world was only 14,000 gross tons more than the launchings for the period. The gap now, however, is not as large as at the end of the March, 1927, quarter.

A continued gain in the construction of tankers of 1,000 tons gross and above is shown, nearly 125,000 tons more now being under way than at the end of the March quarter. A year ago the construction of tankers under way throughout the world, aggregated only 261,000 gross tons.

MOTORSHIP TONNAGE LEADS

A jump of nearly three hundred thousand gross tons in the volume of motorships building was made during the last quarter, bringing the total now building to nearly 1,460,000 gross tons for the world, as against 1,172,000 at the end of the March quarter, and only 885,000 tons at this time last year.

Under the present status, 43 percent of the world's building of motorships is being done by Great Britain and Ireland, while those countries' share in the production of all other types of vessels amounts to 55 percent; and their share of the world output of all types of ships is 49 percent, or almost as much as all other countries combined. The total amount of motorship tonnage now being built throughout the world is about 78,000 gross tons greater than all other types combined.

Lloyd's returns also show the power of various types of marine engines being built or installed in all countries. These show the chief advance to be in oil engines, the total indicated horsepower at June 30 being 1,102,424, as compared with 918,536 at the end of the March quarter. The indicated horsepower of new steam reciprocating engines also shows an advance, the world total rising from 507,126 at the end of March to 580,600 at the end of June. While the total shaft horsepower of steam turbines under way at the end of June was only 338,050, as compared with the world figure of 496,555 for the March quarter, the comparison is not to be regarded as showing a definite decline in the total power of this type of engine building, as returns for Germany are not available.

**New Wrigley tug Louie Black, equipped with Winton Diesel engine**

## Winton Powered Wrigley Fleet Makes Impressive Sight

THE recent trial trip in Los Angeles harbor of the new Winton powered towboat *Louie Black,* built by the William Muller Shipyard, Wilmington, Cal., and owned by the Wilmington Transportation Company, one of William Wrigley's many Pacific Coast interests, was unique in that as the new boat went down the channel on its trip to sea four other Wrigley towboats, the *Milton S. Patrick, John N. Stewart, David P. Fleming,* and *D. M. Renton,* all Winton powered boats, swept along in her wake. The 5 tugs were bedecked with flags, and received a vociferous welcome. Very appropriately the Los Angeles fireboat *No. 2,* another Winton powered boat, stuck its nose out of its fire station as the new boat was passing and joined in the celebration.

Dropping her escorts at the breakwater, the new tug proceeded to Avalon, where 100 guests aboard had lunch at St. Catharine's, returning in the evening to Los Angeles.

The principal dimensions and equipment of the five boats are listed below:

| Vessel | Length | Beam | Draft | Engines |
|---|---|---|---|---|
| *Louie Black* ..... | 86 feet 6 inches | 24 feet | 11 feet 6 inches | 1-400 Hp. Winton Diesel |
| *Milton S. Patrick*... | 97 feet | 22 feet | 14 feet | 2-300 Hp. Winton Diesels (electric drive) |
| *David P. Fleming*... | 85 feet | 17 feet | 10 feet | 1-350 Hp. Winton Diesel |
| *John N. Stewart*..... | 97 feet | 22 feet | 14 feet | 2-300 Hp. Winton Diesels (electric drive) |
| *D. M. Renton*..... | 85 feet | 17 feet | 10 feet | 1-350 Hp. Winton Diesel |

The new boat was christened in honor of Captain Louie Black, a veteran of the Wrigley fleet and one of the best known men in the work boat and towing business in Southern California. She met every requirement of the trial and is now in service in the Los Angeles harbor.

## Marine Standards Committee Approves 14 New Standards

AT a meeting of the Executive Board of the American Marine Standards Committee held in June fourteen standards were approved for promulgation as follows:

Metal Rack—Saddle Type—For 2½-inch Fire Hose
Wooden Rack for Fire Hose
Pilot Ladder
Tubular Steel Cargo Booms for 5, 10, 15, 20 and 30 tons capacity.
Flanged Couplings for Propeller Shafting
Loose Couplings for Inboard Propeller Shafts
Tail Shafts and Stern Tube Bearings
Propeller Keys
Propeller Nuts
Stern Tube Stuffing Boxes.

It was indicated at the board meeting that a final report may be expected in September from the special committee on stability and loading, which will definitely recommend the issuance of standard instructions on the subject, to apply to new passenger vessels. It was also indicated at the meeting that a tentative report may be expected from the same committee on the subject of bulkheading and subdivision, to recommend rules on the subject for application to new passenger vessels, in accord with the requirements of the International Conference for Safety of Life at Sea.

A final draft of proposed standard specification for fire clay refractories was submitted to the technical committee on engineering details. Final drafts of proposed standards for hubs for built-up propellers; fairwater caps for propeller hubs; propeller hub studs, nuts and lock screws and packing glands for propeller hubs, are to be submitted shortly.

Twenty-two publications comprising about 30 approved standards are in course of printing and distribution is expected to begin early.

## Plans for New Dredge

CHIEF Engineer Frank G. White has been instructed by the San Francisco harbor board to prepare specifications for a new dredge to be used by the board along the San Francisco water front.

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## Bethlehem Shipbuilding Corp. Fore River Plant Awarded Contract for Five U. S. Coast Guard Cutters

A CONTRACT for the construction of five Coast Guard cutters *Nos. 45, 46, 47, 48* and *49* has been awarded to the Bethlehem Shipbuilding Corporation, Ltd., Bethlehem, Pa., by the United States Coast Guard, Washington, D. C., at a price of approximately $3,172,550. The cutters will be built at the Quincy, Mass., plant of the Bethlehem Corporation. Tenders were sent to 15 shipbuilding companies on the Atlantic and Pacific coasts and the Great Lakes, but only two bids were submitted. The other proposal was received from the Newport News Shipbuilding and Drydock Company, Newport News, Va. Three of the cutters are to be completed in the autumn of 1928 and the other two the following spring.

The vessels are to have a length overall 250 feet; beam, molded, 42 feet; displacement, 15 feet mean draft, about 2,075 tons, and turbo-electric drive, single screw, shaft horsepower 3,000.

Appropriations for the first three vessels cover the total cost and the shipbuilder may build the vessels as rapidly as he desires. For the last two vessels appropriations cover a total expenditure of about $650,000 during the period July 1, 1927 to June 30, 1928, and the shipbuilder must arrange his building program for these two vessels to limit payment vouchers made within said period within that total sum.

Westinghouse propelling machinery and miscellaneous electrical equipment for the first three vessels will be furnished by the government. For the last two vessels, contract for the machinery to be furnished by the government will not be awarded until after July 1, 1927. The boilers, boiler room equipment and other auxiliaries for all five vessels will be similar.

## Standard Unit Navigation Company Places Contracts for $500,000 in Barges

A CONTRACT, calling for the construction of Sunco steel towboats and barges to be used in inland river freight hauls, has been awarded the Nashville Bridge Company, Nashville, Tenn., by the Standard Unit Navigation Company of St. Louis, Mo., at a price of about $500,000. Work on two of the special type towboats with Diesel electric drive and two steel box barges will be started upon completion of the plans by engineers of the navigation company.

The towboats are special features of the Sunco system and the company holds the patent rights on this type. They will be equipped with Diesel electric drive. Due to their design and construction they will operate in less than half the depth necessary for the old-style river boats. They are to be equipped with a special type of shallow water wheel, with the blades or paddles entering and leaving the water with the least disturbance.

The larger barges will be 100 feet long and 16 feet wide, drawing 12 inches empty and one additional inch for every four tons of load. The smaller barges will be 50 feet long and 16 feet wide. All of the barges are designed to load at the side or top.

# Ship Construction and Repair Bids

## Dubuque Boat Works Awarded Contract for Inland Waterways Corporation Towboat

TENDERS were received and opened by the Inland Waterways Corporation, Washington, D. C., on July 8, for the construction of an additional towboat for the upper Mississippi river service. The towboat is to be similar to the three now being constructed for the Inland Waterways by the Dubuque Boat and Boiler Works, Dubuque, Iowa.

The boat will have a length on deck 132 feet; length overall 159 feet 4½ inches; beam, molded, 35 feet; beam overall 35 feet 1¼ inches; depth, molded, 5 feet; crown of deck 6 inches. It will be of steel construction, with watertube boilers, equipped with oil burners. The engines are to be of the Nordberg type or equal, of approximately 600 indicated horsepower. The proposals received were as follows:

| Name | Price | Delivery |
|---|---|---|
| Dubuque Boat and Boiler Works, Dubuque, Iowa | $168,375 | Cairo, Ill., in 270 days |
| Howard Shipyards and Dock Company, Jeffersonville, Ind. | 187,473 | Cairo, Ill., in 9 months |
| Charles Ward Engineering Works, Charleston, West Va. | 195,230 | Cairo, Ill., in 12 months |
| Charleston Drydock and Machine Company, Charleston, S. C. | 222,350 | Charleston, S. C., in 410 days |
| (Alternate) | 227,350 | New Orleans in 425 days |
| Dravo Contracting Company, Pittsburgh, Pa. | 237,750 | Cairo, Ill., in 335 days |
| (Alternate) | 233,750 | Neville Island. |

Contract for the work was awarded to the Dubuque Boat and Boiler Works, Dubuque, Iowa.

## Bids Received for Maneuver Boat Hulls and Derricks

TENDERS were received and opened on Monday, July 11, by the United States Engineer Office, Louisville, Ky., for furnishing all labor and materials and constructing and delivering six maneuver boat hulls and derricks as follows:

| Name | Lot A | Lot B | Lot C | Lot AB | Lot AC | Lot BC | Lot ABC |
|---|---|---|---|---|---|---|---|
| Peter Jensen and Company | $12,000 | ..... | $22,200 | ..... | ..... | ..... | ..... |
| Charles Hegewald | 13,900 | $34,490 | 22,980 | $48,390 | $36,880 | $57,470 | $71,370 |
| Dravo Contracting Company | 15,165 | 37,315 | 25,810 | 52,230 | 40,775 | 59,385 | 74,200 |
| Howard Shipyards and Dock Company | 15,973 | 40,743 | 27,943 | 56,716 | 43,973 | 68,743 | 84,743 |
| Charles Ward Engineering Works | 16,845 | 41,685 | 28,825 | 59,970 | 45,125 | 65,385 | 81,660 |
| Dubuque Boat and Boiler Works | 18,000 | 39,000 | 28,000 | 55,000 | 44,000 | 64,000 | 77,000 |
| Midland Barge Company | 17,740 | 44,700 | 30,700 | 62,440 | 48,440 | 74,000 | 91,740 |

The award has not as yet been made.

## Repair Bids on S.S. Challamba

BIDS ranging from $120,000 to $150,000 were opened at Victoria recently for repairs on the steamship *Challamba*, which stranded on White Cliff island about a month ago. The tenders received were:

| | | |
|---|---|---|
| Burrard Drydock Company, Ltd. | $120,000 | 135 |
| Yarrows, Ltd. | 145,000 | 125 |
| Todd Drydocks, Inc. | 146,000 | 63 |
| Victoria Machinery Depot | 149,000 | 135 |
| Lake Union Drydock and Machine Works | 150,000 | 60 |

The Pacific Steamship Company, Seattle, Washington, owner of the vessel, has referred the bids to Lloyds for decision.

## Transport Grant to Be Repaired at Cost of $200,000

THE United States Government plans to spend at least $200,000 in repairing decks and making alterations on the army transport *Grant* while she is at Mare Island this year. The work was not believed necessary until after some of the deck was removed for inspection.

## Bids Received for Two Sets of Turbo-Electric Machinery for U. S. Coast Guard Cutters

TWO tenders were received on Friday, July 1, by the United States Coast Guard, Washington, D. C., for two turbo-electric ship propulsion sets, and other electrical and miscellaneous equipment for Coast Guard cutters *Nos. 48* and *49*. The turbo-electric propulsion sets will each consist of one main and two auxiliary generator sets. The main generator set will consist of a main steam turbine developing approximately 3,500 horsepower at 3,000 revolutions per minute. Steam will be supplied to the turbine at 250 pounds per square inch and 250 degrees superheat. The main turbine will be direct connected to an alternating current generator having an output of approximately 2,600 kilowatts at 2,300 volts and 3,600 revolutions per minute. This generator furnishes current for steam auxiliary purposes and for a synchronous propelling motor of 3,000 shaft horsepower operating at 163.5 revolutions per minute.

The auxiliary generating sets to be supplied are of the three-unit type each consisting of a steam turbine, a direct current generator and an alternating current machine. The turbine driving the auxiliary generator will be a multi-stage machine, designed to operate at 250 pounds per square inch pressure and 250 degrees superheat. The generators driven by this machine will have a combined output of 200 kilowatts.

The bids received for the sets were as follows:

Westinghouse Electric and Manufacturing Company ..... $204,000
General Electric Company ..... 237,000

At the time of going to press it was learned that the contract for the construction of the two turbo-electric sets was awarded to the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

## Shipyards Asked to Bid on Diesel Drive Yacht

INFORMATION has been received that B. T. Dobson, naval architect, New Bedford, Mass., has submitted plans and specifications to various shipyards for proposals for the construction of a Diesel yacht, the principals for which are not as yet known. This yacht will have a length of about 150 feet.

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# Notes from the Great Lakes

## Pittsburgh S.S. Co. Plan to Build Two Ore Ships Again Under Consideration

THE plan of the Pittsburgh Steamship Company, Cleveland, Ohio, to build two more lake freighters, which was proposed some months ago, has been brought to the fore again with the information that the Pittsburgh Company has recently asked prices on steel for two vessels. No definite confirmation of this rumor has so far been received, but undoubtedly these ships will be laid down in time for the next season's business. They will probably in most of the essential details be duplicates of the last order for ships placed by this company. The overall length in this case would be about 600 feet, length on the keel 580 feet, beam 60 feet and depth 32 feet. Scotch boilers and triple expansion engines will be used for power. About 10,000 tons of steel is to be required for the two ships which, if the order goes through, will undoubtedly be supplied by the United States Steel Corporation of which the Pittsburgh Company is a subsidiary.

The company has added two ore carriers to the fleet this season, contracts for which were placed with the Toledo Shipbuilding Company, Inc., Toledo, Ohio, and the Great Lakes Engineering Works of Detroit, Michigan, in the Fall of 1926. At the time these orders were placed indications pointed to the early construction of two more so that the present information checks with this plan and a confirmation of it will probably be received shortly.

## Freighter Harry Coulby Badly Damaged by Fire

FIRE recently damaged the forward quarter of the freighter *Harry Coulby*, now being built at the Lorain yards of the American Shipbuilding Company for the Interlake Steamship Company, Cleveland, Ohio, and all the work will have to be renewed. The vessel, which is the largest ore carrier on the Great Lakes, was scheduled to sail on her first trip in about 10 days, but on account of the damage she will be delayed about a month.

## Great Lakes Repairs

THE steamers *W. H. Donner* and *City of Walkerville* collided recently in the Detroit River. The *Donner* had several plates damaged and went into drydock for repairs. The *City of Walkerville*, which was bound for Montreal was laid up for repairs.

The steamship *M. E. Farr* and the freighter *Harvey H. Brown* collided in Lake Superior. The *Brown* was taken to a shipyard for repairs.

The steamship *A. Ziesing* went aground in the Soo and was later taken to South Chicago for repairs.

The big derrick scow, owned by John Stanton, rolled over near the ore dock of the Corrigan-Kinney Steel Company in Cleveland and is now on the bottom.

The Lake Carriers' Association has recommended a draft of 19 feet 6 inches for St. Mary's river and of 19 feet 9 inches for St. Clair river.

## Jones and Laughlin Steel Corp. Inaugurates Car Ferry Service on the Ohio

THE first car ferry ever operated on western rivers by a steel manufacturing concern has successfully gone down the upper Ohio. The ferry belongs to the Jones and Laughlin Steel Corporation. The ferry started on the Monongahela river and passed through Pittsburgh and docked at the Aliquippa works of the company at Woodlawn, 22 miles down the Ohio river. The barge transported eight freight cars loaded with steel products. Only one of the fleet of ferry barges built for the company was used in the experimental trip. The establishment of this car ferry service is the third inland waterways venture in which the Jones-Laughlin concern has been a pioneer. It was the first steel company to establish a service for the transportation of coal in river barges from mines to the mills and coke ovens. This was put into operation 35 years ago. In 1921 the company turned to the Ohio and Mississippi rivers for lower costs in delivering steel products in steel barges at Cincinnati, Louisville, Memphis and New Orleans, with a wide interior distribution from these cities.

## Swedish Engineer Praises Cleveland Port Facilities

KARL O. H. NILSON, chief engineering counsel for the harbor commission of Stockholm, Sweden, while in Cleveland, after visiting New York, Boston, Albany, Syracuse and Buffalo, inspecting freight handling and loading facilities, paid a high tribute to the Cleveland port. He said the Stockholm harbor needs the best freight loading and unloading facilities in the world to handle the increasing iron ore and wood pulp export business from Sweden to Germany, Belgium, France and England. After inspecting the unloading machinery in use by the American Steel and Wire Company and the Pennsylvania Railroad he said he believed he had found what Stockholm needs. The cars and machinery are built by a Cleveland firm, the Wellman-Seaver-Morgan Company. His report adds force to that of Colonel Edgar Jadwin, United States army engineer in charge of the river and harbor development, and Captain Robert Dollar, the famous Pacific Coast steamship owner, both of whom have declared that Cleveland is the finest port on the Great Lakes.

These experts assert that with the proper municipal development of Cleveland's port facilities she will take her place in the front rank of the lake cities.

## Eight Hanna Boats Receive Safety Bonus

IT is noteworthy that the lake fleet of the M. A. Hanna Company, of Cleveland, on which a record of safety bonuses has been kept only since 1924, includes eight steamers on which no injury occurred for three consecutive years sufficiently serious to cause the injured to leave the ship. The eight steamers on which the bonus was paid in 1926 were the *R. L. Agassiz, Quincy A. Shaw, J. J. Turner, Edward A. Urig, Herbert F. Black, Joseph Wood, L. C. Hanna*, and *Louis W. Hill*.

## D., M. & N. Ore Docks Load 20 Million Tons During Shipping Year

A LITTLE more than 35 years ago, the staunch whaleback steamer *No. 102* shoved her blunt nose through the waters of the Duluth-Superior harbor and tied at the Allouez Bay dock where the first ore cargo to be shipped by the Duluth, Missabe and Northern Railroad company, was poured into her holds. As cargoes went at that time, it was of fair size, 2,073 gross tons being shipped.

Now, after more than a quarter of a century of progress in navigation, three ore docks are being operated by the D., M. & N. railroad at the head of the Lakes, and every day huge lake freighters are being loaded with cargoes that range from 8,000 tons to 12,000 tons of ore.

Since the first cargo carried by the whaleback in 1892, a total of 340,000,000 gross tons have been shipped by the D., M. & N. docks to lower lake furnaces. At present from 18 to 20 million tons of ore are shipped during the navigation season.

Two of the docks over which this large tonnage is handled are constructed of steel and one of wood. Each dock is 2,334 feet long from 50 to 60 feet wide and 72 to 84 feet high, with 384 pockets in each. Each pocket has a capacity of from 300 to 400 tons of ore.

Each dock has deep water connections with the main channels of the harbor, making it possible for lake freighters to load at a 21-foot depth. The average cargo loaded is from 8,000 to 12,000 tons.

## Cement Carrier Launched at River Rouge Shipyard

THE steamer *S. T. Crapo*, which is being built for the Huron Portland Cement Company, was dropped into the water at the River Rouge yards of the Great Lakes Engineering Company on July 10. Miss Alice Boardman, daughter of John W. Boardman, president of the cement concern, and the Huron Transportation Company, broke a bottle of champagne on the bow of the vessel. The new cement carrier, which joins the fleet of the company, is named after Stanford T. Crapo, secretary-treasurer of the company, and she will ply between Deport, Alpena, Cleveland, Buffalo, Duluth and Milwaukee. Two other steamers operated by the company are the *John W. Boardman* and the *Samuel Mitchell*.

## Deputy Commissioners Appointed to Administer Longshoremen's and Harbor Workers' Compensation Act

THE United States employes' compensation commission has selected the following deputy commissioners to administer the Longshoremen's and Harbor Workers' compensation act for the Great Lakes districts.

Arthur J. Altmeyer of Madison, Wis., is the officer assigned to Cleveland and Leonard C. Brown of San Francisco has charge of the office established in Chicago.

## Change of Address

The Lake Carriers' Assembly rooms in Milwaukee have been moved from 280 West Water Street to 310 State Street.

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## S.S. Caracas of Red D Line Launched

THE Steamship *Caracas* of the Red D Line, New York, was launched at the plant of the Newport News Shipbuilding and Drydock Company, Newport News, Virginia, on Thursday, June 30. The *Caracas* is 336 feet long, 51 feet beam and has a loaded draft of 18 feet, with accommodations for 137 passengers. She is a twin-screw vessel of 6,500 tons displacement, equipped with oil-burning turbines, giving her a speed of 13 knots. The vessel was designed by Theodore E. Ferris, naval architect of New York. The *Caracas*, which will be delivered to her owners early in September, has been especially constructed for the tropical trade.

## TRADE PUBLICATIONS

RADIO COMPASS.—In a small folder the Federal Telegraph Company, San Francisco, has detailed the characteristics of the new Kolster radio compass. Fifteen new features of the Kolster instrument are described in the folder.

FIRE NOZZLES.—Andrew J. Morse and Son, Inc., Boston, Mass., manufacturers of fire fighting equipment, including the Invincible nozzle, has issued a catalogue outlining the uses of various type nozzles as applied to fire fighting apparatus. In the marine field the Invincible nozzle is extensively applied to fire boats, tug boats and other floating equipment.

WELDING AND CUTTING EQUIPMENT.—A complete catalogue of welding and cutting equipment in which gas is used has been issued by the International Oxygen Company, Newark, N. J. In addition to various types of welding and cutting torches the catalogue contains descriptions of regulators, hose connections, acetylene generators and numerous other supplementary equipment manufactured by this company.

METERS.—The Worthington Pump and Machinery Corporation, New York, has issued a booklet which describes a trip through the Worthington Meter Factory at Harrison, N. J. This plant is devoted exclusively to the manufacture of meters of various types. The trip is presented to readers of this booklet through the medium of numerous illustrations from the first operations in the foundry to the final testing of finished meters.

CENTRIFUGAL PUMPS.—The Worthington Pump and Machinery Corporation, New York, has issued a new bulletin on Worthington high efficiency centrifugal pumps. These pumps, it is claimed, have efficiencies of from 8 to 10 percent higher than the average centrifugal pump. A special feature of the bulletin is an analysis of 10,000 pump inquiries received by this company to determine the heads and capacities most commonly specified by pump users. With this analysis as a basis, Worthington engineers set about designing new lines of high efficiency pumps especially for the heads and capacities most commonly used.

LUX-RICH SYSTEM OF FIRE PROTECTION.—Under the title of "Incidents Instead of Disasters" Walter Kidde and Company, New York, has issued a booklet outlining the application and function of the Lux-Rich system of fire protection as applied to various types of ships. The Lux-Rich system performs two functions—detection of fire and the extinguishing of an incipient blaze through the same pipe line. In addition to the piping, the system comprises a detecting cabinet, a carbon dioxide supply stored in cylinders and a valve manifold. Each hold in a ship which utilizes the system is connected with the wheel house through the detecting cabinet by means of ¾-inch galvanized pipes. Any sign of smoke in one of the compartments is immediately indicated visually in the detecting cabinet after which the carbon dioxide may be forced to the compartment and smother the fire. Typical installations of the system are described in this booklet.

## BUSINESS NOTES

Frederick M. Fisk on July 1 became manager of the Pacific Coast office of McIntosh & Seymour Corporation, 815 Sheldon Building, San Francisco.

The Ingersoll-Rand Company, 11 Broadway, New York, has opened a branch office at 236 High street, Newark, N. J., with F. K. Armstrong, formerly connected with the company's New York sales branch in charge.

O. M. Gordon has joined the Marine Sales Department of the Vacuum Oil Company in the capacity of Technical Representative covering the marine field of the port of New York.

James S. Milne, 17 Battery Place, New York, has announced that he will represent the Deutsche Schiff-und Machinenbau Aktiengesellschaft in America specializing in the Bauer-Wach system of combination machinery. Any inquiries in connection with this system should be addressed to Mr. Milne who is at present negotiating with several firms in this country to manufacture machinery under license from the German concern.

Air Reduction Company, Inc., 342 Madison Avenue, New York, has purchased the business, insofar as the manufacture and sale of oxygen, acetylene and kindred products are concerned, of the United Gas Improvement Contracting Company, a subsidiary of the United Gas Improvement Company and the United Oxygen Company, Philadelphia. The purchase includes oxygen plants at Philadelphia, Chester, Milton, Enola and Reading, Pa., and an acetylene plant at Bridgeport, Pa.

Paul D. Cravath, for 30 years general counsel, was elected temporary chairman of the board of directors of the Westinghouse Electric & Manufacturing Company at a meeting of directors held July 6 in New York City. The board adopted a resolution instructing the executive committee to nominate a permanent chairman. It was stated, on behalf of the committee, that they had no one at present in view for this office. The only addition made to the board of directors was the selection of W. L. Mellon of Pittsburgh. The board also adopted a resolution in memory of the late chairman, General Tripp.

## Marine Societies

### America

**American Marine Association.** 30 Church St., New York. President—Col. E. A. Simmons.

**American Marine Standards Committee.** Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

**American Society of Marine Designers.** Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

**American Society of Marine Engineers.** 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

**American Society of Naval Engineers.** Navy Department, Washington, D. C. Secretary-Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

**American Steamship Owners' Association.** 11 Broadway, New York. President—H. B. Walker.

**Atlantic Coast Shipbuilders' Association.** 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

**Council of American Shipbuilders, Inc.,** 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

**Jersey Marine Club,** 4th and River streets, Hoboken, N. J. President—Col. Bartlett.

**Lake Carriers' Association.** President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

**National Association of Engine and Boat Manufacturers.** 29 West 39th Street, New York City. Secretary—Ira Hand.

**National Association of Masters, Mates and Pilots.** National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

**National Marine Engineers' Beneficial Association.** Headquarters, 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

**National Merchant Marine Association.** Munsey Bldg., Washington, D. C. President—Hon. J. E. Ransdell.

**Neptune Association.** 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

**New York and New Jersey Dry Dock Association,** 111 Broadway, New York. President—Jonathan Moore.

**Ocean Association of Marine Engineers.** 15 Whitehall St., New York. Secretary—Bert L. Todd.

**Port of New York Authority.** 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

**Society of Naval Architects and Marine Engineers.** 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

**The Maritime Association of the Port of New York.** 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

**The New York Tow Boat Exchange.** 11 Moore St., New York. Manager—Langdon W. Smith.

**The Propeller Club of the Port of New York.** President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 32 Broadway, New York.

**United States Naval Institute.** Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

**United States Ship Operators' Association.** 149 Broadway, New York. President—Winchester Noyes.

### Canada

**Grand Council N. A. of M. E. of Canada.** Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

### Great Britain

**Institute of Marine Engineers, Incorporated.** 85/88 The Minories, London, E.1.

**Institution of Engineers and Shipbuilders in Scotland.** 39 Elmbank Crescent, Glasgow.

**Institution of Naval Architects.** 5 Adelphi Terrace, London, W. C.

**North East Coast Institution of Engineers and Shipbuilders.** Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

### France

**Association Technique Maritime et Aéronautique. Secrétariat Genéral—7,** rue de Madrid, Paris (8e).

### Italy

**Collegio Degli Ingegneri Naval e Meccanici in Italia.**

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